Charles Hayward's Carpentry Book

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CHAPTER I

TOOLS: THEIR USE AND CARE

The Preliminary Kit and the Bench

Although the general run of woodwork does not call for a particularly big kit of tools, there are certain essentials without which it is unreasonable to expect to do much work. We therefore give straightway a list of tools in which we advise the reader to invest. For purely rough carpentry some of them might be omitted, whilst for better work some additional ones are needed, but it is a good all-round kit with which to make a start. Extra tools can be purchased as occasion arises, and quite a number can be made by the reader himself.

One word of warning: do not buy so-called cheap tools—they really are not cheap in the long run. This does not mean that the finest precision tools are needed; what it does mean is that, if the price has been cut beyond certain limits, something has had to suffer, and faults do not take long to develop in tools. It is therefore better to pay the price listed by any reputable tool-maker in his catalogue.

PRELIMINARY KIT OF TOOLS

Those going in for special branches of woodwork may require to alter the list somewhat, either in choosing different tools or in varying the sizes. For instance, for garden carpentry a rather larger size of handsaw is desirable, whilst for toy-making a fretsaw or scrollsaw is certainly desirable. Then again, those who feel justified in going to the extra cost could substitute the ratchet brace

shown in Fig. 1 for the plain kind, and obtain a combination oilstone having one side coarse and the other fine. All these are matters which readers can best decide for themselves, but the kit as listed will prove useful for all-round purposes.

20-in. or 22-in. handsaw, fine teeth
9-in. or 10-in. backsaw, fine teeth
14-in. or 16-in. jack-plane, 2-in. cutter
Wood smoothing-plane, 2⅛-in. cutter
or
Stanley pattern iron smoothing-plane, 2-in. cutter
Rebate-plane, 1¼-in. cutter
Scraper, 5-in.
Chisel (firmer), ¾-in
" " ¼-in.
Oilstone, 8 in. by 2 in.
Cutting gauge
Brace, 8-in. sweep
Twist bit, ⅜-in.
Centre bit, ¾-in.
Shell bit, ⅛-in.
Countersink, ½-in.
Pincers, 6-in.
Hammer, 8-oz. head
Mallet, about 18 oz.
Square, 6-in.
Rule, 2-ft., folding
Screwdriver, 6-in. blade
Bradawl

THE BENCH

All the above tools and some useful extras are dealt with in detail in the next section, and it remains for us to consider here the bench. Many a fine piece of work has been turned out on a kitchen table, but this is at best only a makeshift. Light benches do not cost a great deal. A thoroughly sound one with a 2-in. beech top cost between £2 and £4 pre-war. Alternatively, the reader can knock up the bench in Fig. 2 himself. It has a 2-in. beech top, though for light work a thinner one could be substituted. A length of 5 ft. is desirable, though here again the reader may decide to cut it down. The framework can be in deal. One feature to note is the wide top

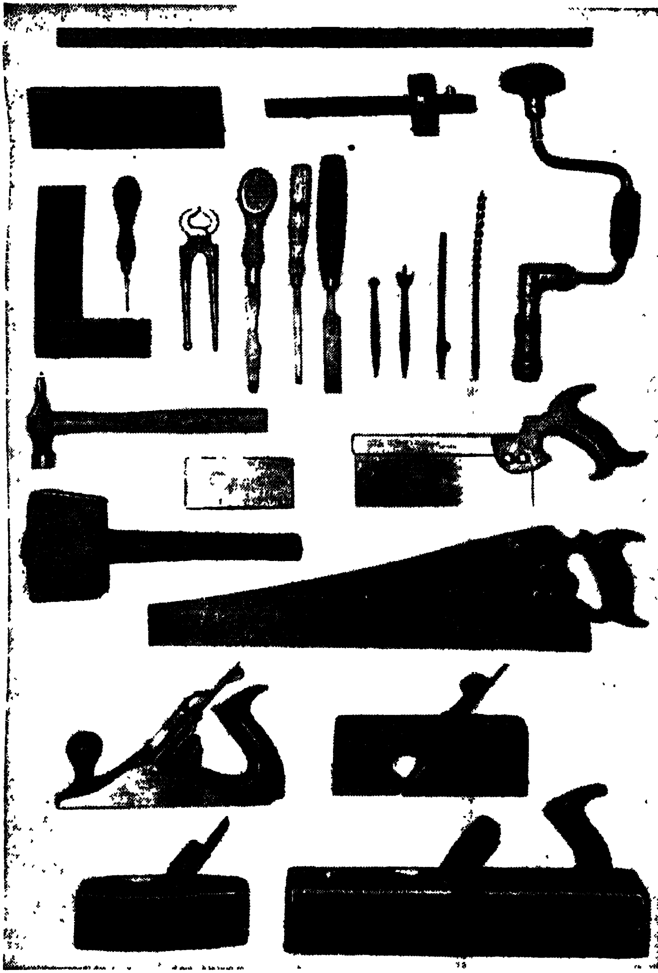


FIG. 1.—SUGGESTED PRELIMINARY KIT OF TOOLS.

The beginner is advised to invest in this kit at the outset. The metal and wooden smoothing-planes are alternatives.

front rail. This gives increased rigidity to the top at the front, where it is most needed, and, being notched over

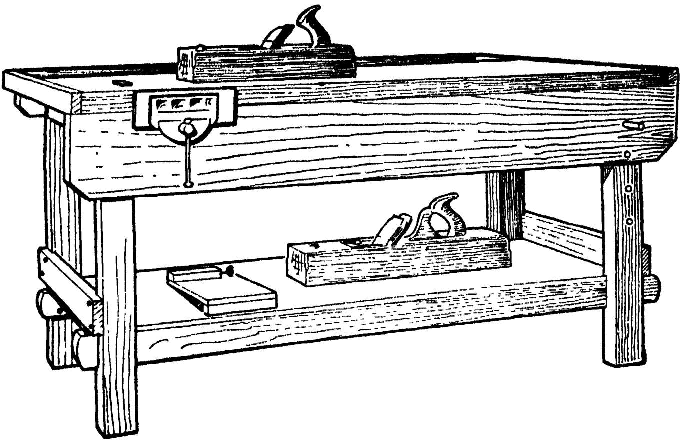


FIG. 2.—SIMPLE 5-FT. BENCH WITH 2-IN. BEECH TOP.
A well is provided at the back to hold small tools, and there is a wide shelf for larger tools beneath.

the legs, helps to resist the inevitable stress when such jobs as planing are being done.

THE MAIN FRAMEWORK

Fig. 3 gives the main sizes and Fig. 4 shows how the parts fit together. From this it will be seen that all elaborate joints are avoided. The two ends are made first. Cut out the four legs from 3-in. by 2-in. stuff, and saw off square to length, making the back legs $\frac{1}{4}$ in. less than the others, to allow for the tray at the back (see Fig. 4). At the top, notches 1 in. deep are cut to form a joint for the side-rails (Fig. 4). The last-named are of 3-in. by 2-in. section, and they are notched at the ends to fit the legs. One point to note is that the size, 3 in. by 2 in., is nominal. Planed timber of this so-called size will

finish a full $\frac{1}{8}$ in. less in both ways. The actual size should therefore be worked to rather than the nominal size.

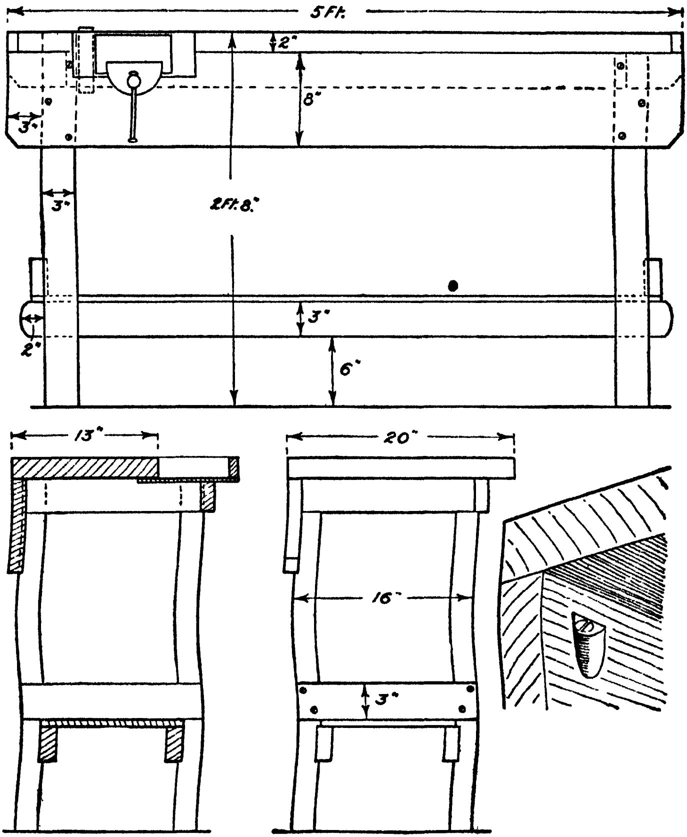


FIG. 3.—FRONT AND END ELEVATIONS OF BENCH.
Method of fixing top to front rail with pocket screws is shown to the right.

The joints can be marked in with square and gauge as described in the section on joints. In all cases corresponding pieces should be cramped together temporarily

so that the marks can be squared across both. The lower rails are of 3-in. by 1½-in. stuff, and are notched at the ends, though no corresponding notches are cut in the legs. It is advisable to avoid weakening the last-named unnecessarily. Put the two ends together independently with glue and screws, fixing the bottom rails 9½ in. from the bottom. Make sure that they are square and are not in winding, and set aside.

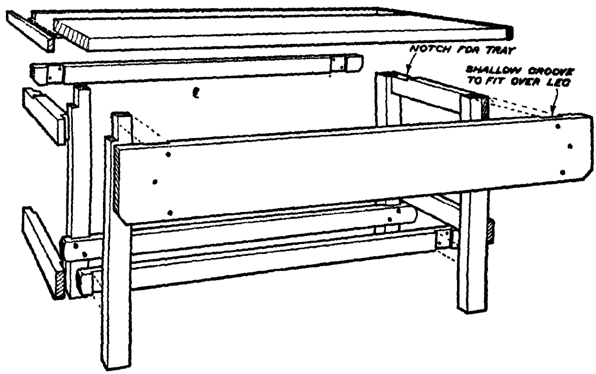


FIG. 4.—HOW PARTS OF BENCH FIT TOGETHER

Front and back rails now follow. The lower ones are notched to fit over the legs at the *inside* (Fig. 4), and they are screwed on ½ in. below the side rails, so that the shelf can fit between. The top back rail is notched similarly, but fits outside—also the front one. It is important that all these joints are made tight, because it is these that give the real resistance to stress in using the bench. To assemble the whole, cut out the shelf in ½-in. plywood (preferably), and screw on the top rails. Turn the whole upside down, insert the shelf (this is cut around the legs at the corners), and fix the lower rails.

THE TOP

The bench top is cut short in length to allow end strips to be fixed on, as in Figs. 3 and 4, and to the underside at the back is fixed the tray bottom of ¼-in. plywood. It is then merely a matter of screwing on the edging all round and fixing the top with screws driven in through the rails from underneath. Fig. 3 shows how screws can be "pocketed" in at the front rail. A bench stop is needed,

CUTTING LIST

	Length.	Width.	Thickness.
4 legs . . .	2 ft. 6½ in.	3 in.	2 in. deal
1 rail . . .	5 ,, ½ ,,	8¼ ,,	1¼ ,, ,,
1 ,, . . .	5 ,, ½ ,,	3 ,,	1½ ,, ,,
2 rails . . .	4 ,, 10½ ,,	3 ,,	1½ ,, ,,
2 ,, . . .	1 ,, 4½ ,,	3 ,,	2 ,, ,,
2 ,, . . .	1 ,, 4½ ,,	3 ,,	1½ ,, ,,
1 shelf . . .	4 ,, 9½ ,,	1 ft. 1 ,,	½ ,, ply
1 top . . .	4 ,, 10½ ,,	1 ,, 1⅛ ,,	2 ,, beech
1 tray . . .	5 ,, ½ ,,	9 ,,	¼ ,, ply
1 edging . . .	4 ,, 10½ ,,	2 ,,	1 ,, beech
2 edgings . .	1 ,, 8½ ,,	2¼ ,,	1 ,, ,,
1 stop . . .	6 ,,	2 ,,	1 ,, ,,

1 bench vice

Extra cutting allowance has been made in length and width. The deal thicknesses are nominal.

and this can be a piece of hardwood about 2 in. by 1 in., fitting tightly in a square hole cut in the top. The vice can conveniently be of the all-metal type. These vary somewhat in detail, so that no definite instructions can be given. Usually it is only a case of cutting a hole in the front rail, though it may be necessary to pack it beneath. The series of holes in the right-hand leg in Fig. 2 are to enable a peg to be inserted to support long timber being planed in the vice.

Various Kinds of Saws

THE HANDSAW

Since all the preliminary cutting up of timber is done with the saw, we may conveniently deal first with the varieties of this tool. The handsaw is used for cutting up the larger pieces of wood, and for general work a length of 20 in. or 22 in. is recommended. If only heavy carpentry is intended, a still larger saw could be chosen, but this is rather cumbersome for cabinet work. It should have fairly fine teeth, so that it can be used for

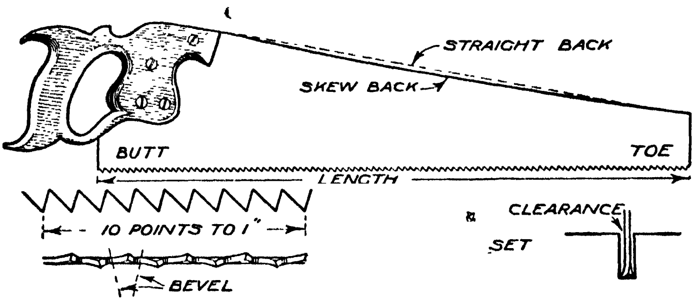


Fig. 5.—Details of the Handsaw

both cross-cutting and ripping. For the latter it is naturally slower than the ripsaw made specially for the purpose, but as a compromise it is the more useful saw.

The tooth size is reckoned at so many points to the inch, this being the actual number of points in an inch, including those at both ends. For instance, in Fig. 5 there are ten points to the inch, and this is a good all-round size. Some saws have what is known as a skew back—that is, the back edge is slightly hollowed in its length—but there is little to choose between this and the straight back. It is just a matter of individual preference. Any good make of saw can be bought with confidence, since it would

always be replaced in the event of a fault developing. Ten points to the inch is a good average.

When first obtained it will be ready for immediate use, and a feature to note is that not only are the teeth sharp so far as the points are concerned, but that it has "set," which means that the teeth are bent over slightly in

FIG. 6.—STARTING THE CUT.
Note how the thumb of the left hand bears against the blade to steady it.

FIG. 7.—HOW CUT IS FINISHED.
The left hand supports the overhanging piece to prevent the grain from splintering.

alternate directions (see Fig. 5). The reason for this is that the saw thus clears itself in the cut or kerf it makes, since the latter is wider than the thickness of the blade. If there were no set, the saw would bind in the kerf after the first few cuts and would be difficult to use. If the saw is held with the back edge in line with the eye, the set will be at once apparent. Good saws are taper-ground,

being slightly thicker at the cutting edge than at the back so that the saw has self clearance. This means that excessive set is unnecessary, and it is easier to use since not so much wood is removed in sawdust.

The blade should be oiled occasionally to keep it free

FIG. 8.—OVERHAND RIPPING ON BENCH.
The wood is cramped down so that it overhangs the edge sufficiently for the saw to clear.

from rust and to make it work easily, and nails in the wood should be avoided at all costs. A single jar on a nail is enough to take off the edge—in bad cases it may break a tooth off. When finished with the saw should be hung up, not placed at random in a chest full of other tools which may damage the points. Do not attempt to

sharpen it yourself unless you have had experience. It is seldom an economy, because, if the teeth become uneven through faulty filing, a professional sharpener will charge more to put it right. Better by far to take it to a reliable sharpener as soon as it becomes dull.

When using the saw never force it. Keep it moving steadily for nearly its full length. Its own weight plus

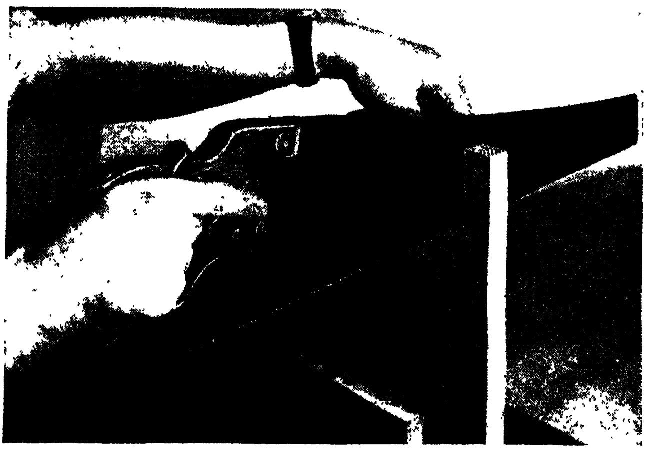


FIG. 9.—CUTTING DOWN IN THE BENCH VICE.
This is often convenient when sawing down small pieces of wood.

the slightest pressure is all that is needed. For a start it is a good plan to place a square on the wood against the blade as a guide to holding it upright. After a little practice the correct angle will come automatically. To start the cut, place the thumb of the left hand against the blade as in Fig. 6. This steadies the blade, enabling it to start in the right place, and prevents an accident in the event of the saw jumping. Make one or two short movements, taking care that the saw works in the right direction, and then give full, easy strokes. When the end is reached,

the left hand can hold the overhanging piece as in Fig. 7, to prevent it from breaking off and so splitting. Note that the index finger of the right hand points along the handle. This gives positive control.

Cutting *with* the grain can be done either on trestles or on the bench by the overhand method shown in Fig. 8. The latter method is handy when just a narrow strip has to be cut off. The wood is cramped down with the edge overhanging, and a few short strokes are made at the top corner with the saw pointing along the wood. The saw is then held upright as shown. In some cases short pieces can be cut more conveniently in the vice, as shown in Fig. 9.

A point to note in all sawing is that, as a rule, the cut is made to one side of the line. The latter represents the finished size of the wood, and if the saw were taken directly along it, the wood would be too small. The cut is therefore made on the waste side, as in Fig. 10, so that the wood can afterwards be trimmed with the plane.

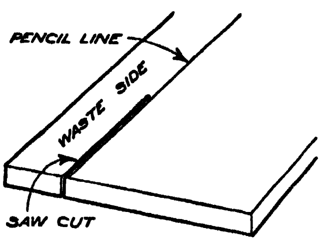


FIG. 10.—SAWING TO PENCIL LINE.
The cut is made on the waste side.

THE BACKSAW

It will be remembered that a length of 9 in. or 10 in. was recommended for this, and if only one saw is to be used, this is a good all-round size. Actually the ideal is to have a 14-in. tenon-saw for heavy cutting, and an 8-in. dovetail-saw for fine joints. It is point for readers to decide for themselves.

The notes given about the handsaw apply in a general way to the backsaw. Fig. 11 shows it in use, and it will be seen that the wood is held on what is known as a bench

hook. This steadies it, and is easily made from odd scraps, as shown in Fig. 12. One point to note is that the

FIG. 11.—USING BENCH HOOK WHEN SAWING.
The purpose of this is to steady the wood. Note how the left-hand thumb bears against the blade of the saw.

strip which bears against the edge of the bench should be fixed on with dowels rather than nails or screws. It is inevitable that with continuous use the wood will gradually be sawn away, and this may result in the nails becoming bared, so jarring the saw.

For the tenon-saw choose one with about twelve or fourteen points to the inch. If, however, only the one 10-in. saw is being bought, it

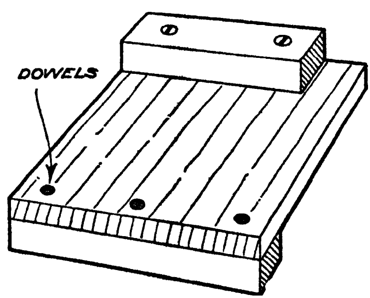


FIG. 12.—DETAILS OF BENCH HOOK.

should have teeth not larger than fourteen to the inch. A dovetail-saw could have twenty or twenty-two points. Whether the saw has a brass or an iron back does not matter. The latter type has the advantage of being cheaper.

SAWS FOR CUTTING SHAPES

Although these are not included in the list of preliminary tools, the serious wood-worker will need them if he has any shaped work to do. The bowsaw is the most

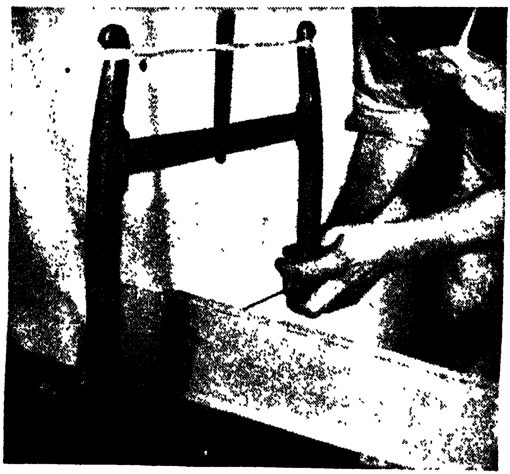


FIG. 13.—HOW BOWSAW IS USED.
Note that the blade is turned to enable it to cut horizontally.

useful, since the blade is under constant tension. It is shown in use in Fig. 13. It is gripped with both hands, the wood being held steady in the vice. The handles to which the blade is attached are free to turn, so that the saw can be used to cut in a direction parallel to the edge. Otherwise its use would be limited by the depth of the blade from the cross-bar. When cutting interior holes the rivet is knocked out at one handle, thus freeing the

blade. The latter can then be passed through a hole drilled in the wood, and the rivet replaced. When not in use the blade should be slackened.

There is, of course, a limit to the distance from the edge at which this saw can cut, and when its use is impracticable the keyhole-saw is needed. It is shown in Fig. 14. Note that the blade can be made to slide into the

FIG. 14.—CUTTING WITH KEYHOLE-SAW.
This is used mainly for interior cuts well in from the edge.

handle, and the general rule is to have out only as much blade as is necessary for the work, because the saw buckles so easily. It is a tool that need be bought only as occasion requires.

One other invaluable saw for shapes, especially to the model-maker, is the fretsaw. Thin wood and small work can be cut satisfactorily only with this. It is used in conjunction with the special V cutting-board sold for the purpose.

USE OF THE PLANE

THE JACK-PLANE

In many ways this is the most useful plane in the kit. It can be set coarse, so enabling the thickness of a piece

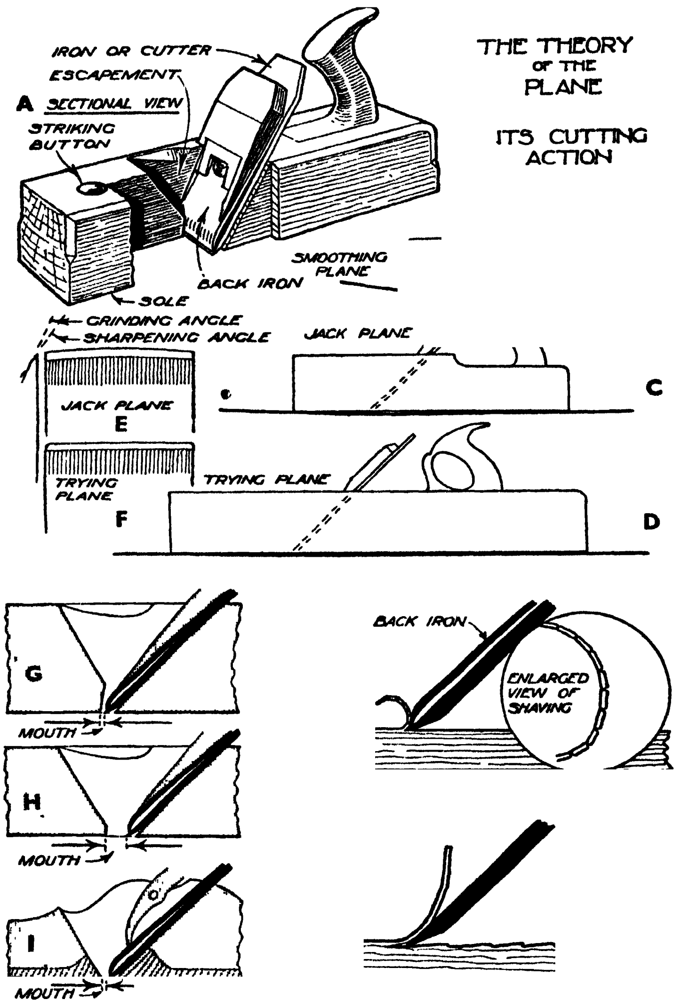


FIG. 15.—PARTS OF PLANE AND HOW IT WORKS.

A. Cut-away view of jack-plane. *B, C, D.* How length of plane affects extent to which it can dip into wood. *E.* Shape and angle of jack-plane cutter. *F.* Shape of trying- and smoothing-plane cutters. *G, H, I.* Small and large mouths. *J.* How back-iron breaks the shaving. *K.* Cutter without back-iron.

of wood to be reduced quickly, and its length prevents it from digging in and producing an uneven surface. The professional woodworker generally reserves it for the rougher sort of work, since he has a long trying-plane with which to shoot joints and true-up a surface. This, of course, is the better plan, but probably few amateurs would care to go to the expense of a trying-plane, and this means that all trueing-up must be done with the jack-plane. There is no difficulty providing it is kept in good condition.

Apart from size, there are two kinds of plane available: the usual pattern used by professional woodworkers (shown at *A*, Fig. 15), and the technical pattern in which the rear portion is stepped down, as at *C*. The latter is the more easy to control, since the handle is lower down, nearer the wood being planed, any tendency to wobble being thus minimised. However, perfectly good work can be done with either.

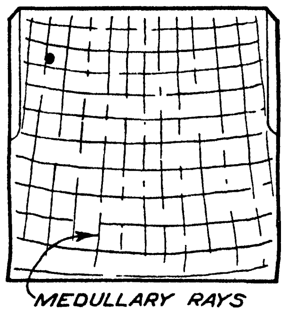


FIG. 16.—END OF PLANE. This shows the best form of grain.

A point to look for in any wood-plane is the direction of the medullary rays at the front. These should be as near upright as possible, as shown in Fig. 16, because there is then less tendency to cast, and, the ends of the rays being exposed on the sole, a hard-wearing surface is ensured. It used to be advised that the plane should be thoroughly soaked in linseed oil by closing the mouth with a piece of wood and putty and pouring in oil at the escapement (*A*, Fig. 15). After several days the oil would be seen to exude at the ends. Some workers still advocate this in a new plane, but most modern opinion is against it, in that it tends to make the plane cast. The alternative

suggestion is to give the whole thing a protective coating of french polish. At least one modern maker sends out his planes french-polished.

THE CUTTING ACTION

To get the best out of a plane it is desirable to understand its action. First of all there is the question of its length. The reason why a long plane is required for trueing-up long surfaces or edges is made clear at *B*, *C*, and *D*, Fig. 15. At *B* is a smoothing-plane, and it can dig into the wood, producing a curve which runs through points located at the front and back of the plane and through the cutter edge at the centre. It is obvious that the farther apart the front and back, the less the plane can dig in (*C* and *D*). These diagrams are, of course, exaggerated, but the principle is the same.

Next there is the question of the back-iron. Its purpose is to break the shaving, so robbing it of its strength, and thus largely preventing it from splitting out. If there were no back-iron as at *K*, Fig. 15, the actual edge of the cutter would not be making the cut, because the shaving would be levered up, with the result that it would be torn up, so leaving corresponding tears on the surface of the wood. By fitting a back-iron as at *J*, the shaving is broken almost as soon as it is raised, and is not so liable to tear out. The closer the back-iron is to the edge, the less liable it is to tear out the wood; but, on the other hand, the resistance is increased considerably. For normal work a compromise is effected, fitting the back-iron about $\frac{1}{16}$ in. from the edge. When a piece of wood with difficult grain has to be planed, the back-iron is advanced and the plane set as fine as possible.

The size of the mouth also has its effect. When small it prevents the shaving from being raised too soon, and thus helps to prevent tearing out. There is a limit to the

size, however, since too fine a mouth may cause choking, especially in a jack-plane, which may have to remove fairly thick shavings.

SHARPENING THE PLANE

When first obtained, the cutter will be ground, but requires to be given a keen edge on the oilstone. Remove the cutter and wedge by striking smartly the striking-

FIG. 17.—SHARPENING THE PLANE-IRON.
The correct angle is from 30 to 35 degrees.

button, and undo the screw holding the back iron. The latter can then be slid off. Put a few drops of oil on the stone and place the cutter on the latter so that the ground bevel lies flat. Now, raising the hands *slightly* so that just the edge of the cutter is touching the stone, work back and forth as shown in Fig. 17. This will turn up a burr at the back, which can be detected by drawing the thumb *across* the edge at the back. This is an indication that it is sharp, and the burr is removed by reversing the cutter

FIG. 18.—REMOVING BURR FROM THE PLANE-IRON.
It is essential that the iron is kept flat.

FIG. 19.—STROPPING THE CUTTER.
It is drawn *across* the hand, first one side and then the other.

flat on the stone and moving back and forth once or twice as shown in Fig. 18. It is then stropped either on a piece of leather glued to a flat board, or by drawing it *across* the left hand, first one side and then the other (Fig. 19). It

FIG. 20.—SETTING THE PLANE.
The plane rests upon a sheet of white paper so that the line of the cutter shows up clearly.

should be noted that it is of the utmost importance that the back is not dubbed over either on the stone or on the leather strop.

Testing the back with the thumb is an indication

whether or not the edge is sharp, but it does not show whether a gash, such as might be caused by a nail, is taken out. This is best ascertained by holding the cutter to the light. A sharp edge cannot be seen, whereas a dull one will show as a thin line of light. Similarly, any gashes will show up light. It is then a case of rubbing down until the whole edge is sharp.

FIG. 21.—USING PLANE ON A BROAD SURFACE.
The left-hand bears down on top of the plane.

Another point to consider is the shape of the edge. A jack-plane iron should be slightly rounded, as shown in exaggeration at *E*, Fig. 15, so that when used on a board the shavings taper away to nothing at the sides. The roundness must not be overdone, as this will cause bad hollows in the surface. In fact, when required for close trueing-up it should be almost straight, with just the corners taken off to prevent them digging in (see *F*).

The back-iron is now replaced, and the two are put in the plane and held by the thumb of the left hand. By placing the plane over a sheet of paper and holding it in

line with the eye, as in Fig. 20, the projection of the cutter can be seen. It should appear as a thin black line. The wedge can then be knocked in and a final sight taken. More projection can be given by tapping the back of the cutter; less by tapping lightly the striking button.

FIG. 22.—WHERE PRESSURE IS APPLIED WHEN PLANING.

On broad surfaces the plane is held as shown in Fig. 21, with the left hand grasping the top. The important parts are the beginning and ending of the stroke. Dubbing over must be avoided at all costs. At the start exert plenty of downward pressure at the front, and as the far end is reached change over the pressure to the back, see Fig. 22. Some workers point the index finger of the right hand.

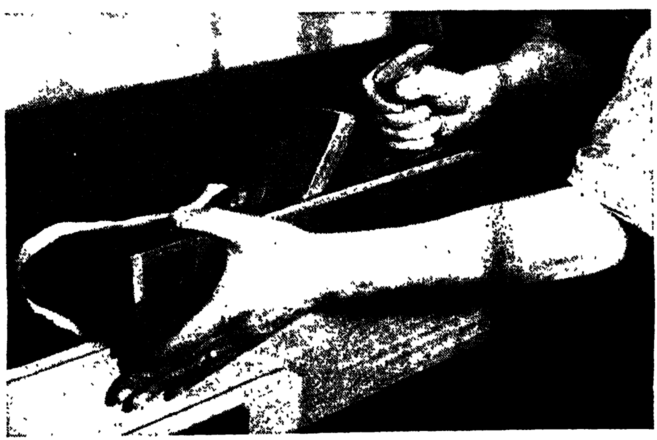


FIG. 23.—HOLDING PLANE WHEN PLANING AN EDGE.
Note how fingers of left hand pass under the sole and bear against the wood to act as a sort of fence.

When planing an edge, the left hand should be held as in Fig. 23, the fingers touching the side of the wood, and so acting as a sort of gauge or fence. The simplest way of shooting an edge straight is to set the plane fine and remove as much wood as possible from the centre until

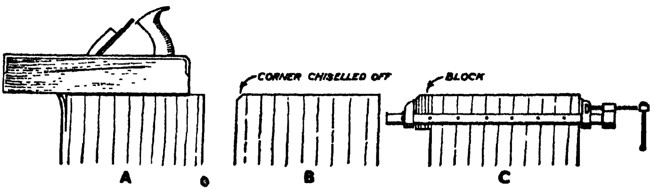


FIG. 24.—POINTS TO NOTE WHEN PLANING END GRAIN.
A. How far corner is liable to split out.
B, C. Methods of avoiding the splitting.

the plane will cut no more. One or two shavings along the whole length will then produce a straight edge, providing the plane is true and the wood not too long. For a start, however, it is advisable to test with a straight-edge—also with a square to see that it is at right angles with the sides.

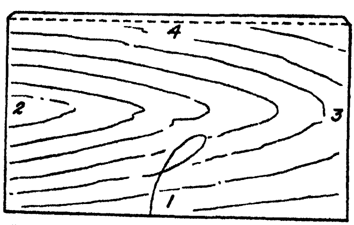


FIG. 25.—ORDER IN WHICH TO PLANE EDGES OF PANEL.

A slight difficulty that occurs when dealing with end grain is that the far corner is liable to split out as at *A*, Fig. 24. This can be overcome by chiselling off the corner as at *B*, or by temporarily cramping on a block of wood as at *C*. The block supports the corner. It is because of this liability to split that the order in planing the edges of a board should be considered. The best plan is shown in Fig. 25. First the front edge is trued; next the two ends, the back corners being

chiselled off, and finally the back edge. The board must, of course, be cut wide enough to allow for this chiselling of the corners. The final planing of the back edge removes the chiselled corners.

A shooting-board is an invaluable appliance, both for planing the edges of thin wood and for trimming the ends square. It is easily made as shown in Fig. 26. The length

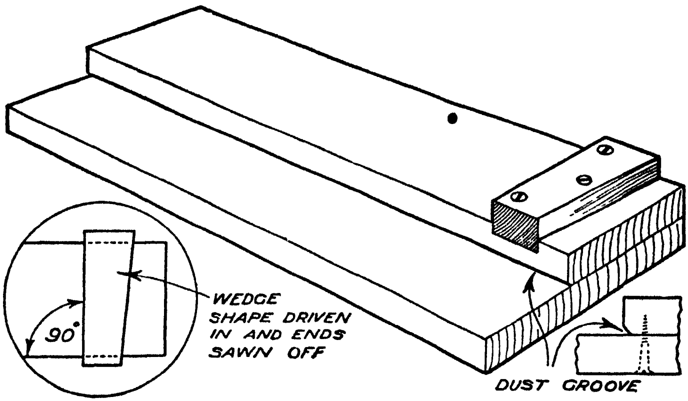


FIG. 26.—SIMPLE SHOOTING-BOARD.
The lower corner of the top piece is slightly bevelled to form a groove for dust.

can be fixed in accordance with the usual size of work to be done. It is shown in use in Fig. 27. When two boards are to be jointed, a face mark is made on each. They are then planed, one with the face side uppermost, and the other with the face side downwards. The reason for this is that if the plane works a trifle out of square, the reversing of the second board gives it a precisely opposite angle, and the two go together in perfect alignment.

THE SMOOTHING-PLANE

A choice of either a wood or metal smoothing-plane is suggested in the preliminary kit of tools. The metal type

is recommended, though it costs rather more. It is so handy for fine work on the shooting-board and in all work generally. Both planes are sharpened in the way described for the jack-plane, though in setting the metal plane no hammer is used, since it is provided with an adjusting screw and lever. One point to note is that all metal planes require lubricating. A piece of candle

FIG. 27.—PLANING THIN WOOD ON SHOOTING-BOARD.
This ensures the edge being square, since the plane cannot wobble.

rubbed on the sole occasionally or a wad of cotton wool soaked in linseed oil can be used.

As the plane is used for final cleaning up on wide surfaces, the cutter should be almost straight, with the corners taken off (see *F*, Fig. 15). Generally the back-iron is set close to the cutting edge, because the plane is used only for comparatively fine work.

IRON PLANES

At this point we may consider iron planes in rather more detail. They are made in a variety of sizes, and the choice depends upon whether you propose to do a fair

amount of work and want a good kit. The ideal is to have a fore plane of 18 ins. length with a $2\frac{3}{8}$-in. cutter, and a smoothing plane either 10 ins. long with $2\frac{3}{8}$-in. cutter or a 9-in. plane with 2-in. cutter. The fore plane is long enough to enable long joints to be planed, and to true large wood generally. The smoother is invaluable for cleaning up table tops, etc., and for general bench work. Two well-known makes are the *Stanley* and the *Record*. Do not buy a cheap make. Its sole will probably not be true, and it will probably be faulty in design so that the cutter will be liable to chatter when it is in a forward position, having insufficient bearing at the back.

Adjustment of the iron plane is by means of a knurled nut which feeds the cutter back and forth. It is always advisable for the final adjustment of the nut to be in a forward direction as it saves the cutter from being jolted back, especially when a heavy shaving is being removed. To enable the cutter to be given even projection a lateral adjustment lever is provided, and movement of this will press the cutter forward one side or the other as may be required. The mouth can also be varied in size, and the usual plan is to set it to the most useful all-round size and leave it at that. This may vary from $\frac{1}{64}$ in. to $\frac{1}{32}$ in. or so. For fine work the narrow mouth is better. To make the adjustment remove the lever cap and cutter. Two screws will be disclosed and these should be slackened. By turning with the screwdriver the adjusting nut beneath the main knurled nut at the back of the frog the latter can be moved one way or the other. Try the cutter in position with no projection at the sole, and, if satisfactory, tighten the two frog screws again.

Fig. 28 shows the iron plane in use. It will be found ideal for end grain and for fine work generally. The general notes on using the wood plane apply equally to the iron plane. One other plane that may be mentioned

FIG. 28.—THE IRON-PANEL PLANE BEING USED FOR TRIMMING END GRAIN.

FIG. 29.—THE BLOCK PLANE BEING USED FOR WORKING A SMALL CHAMFER.

is the block plane, invaluable to those who do fine, small work. Its cutter has its bevel uppermost. Fig. 29 shows it in use.

THE REBATE-PLANE

For some jobs this is essential. It is shown in use in Fig. 30. Note that the fingers of the left hand pass beneath the plane and touch the side of the wood, so acting

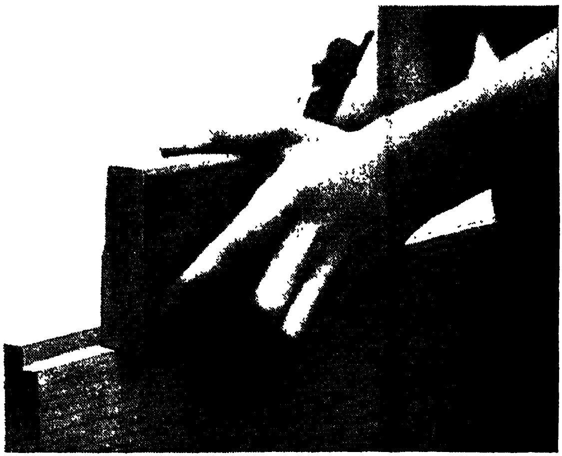


FIG. 30.—THE REBATE-PLANE IN USE.
Note how the fingers of the left hand bear against the wood to act as a sort of fence.

as a fence. Metal rebate-planes are available, and these possess the advantage of having a fence which enables the rebate to be automatically kept parallel with the edge. In any case the width and depth of the rebate should be marked in first with the gauge.

Another similar tool is the bullnose-plane shown in Fig. 31. It is extremely handy for small work—models and so on—and comes in for a great deal of other uses

apart from rebating. It is an excellent investment, though it is not listed in the preliminary kit. One point about it is that the cutter lies with the bevel uppermost—the reverse from the wood planes. In both this and the rebate-plane it is essential that the edge be sharpened perfectly square, because there is little latitude for tapping it over to one side or the other.

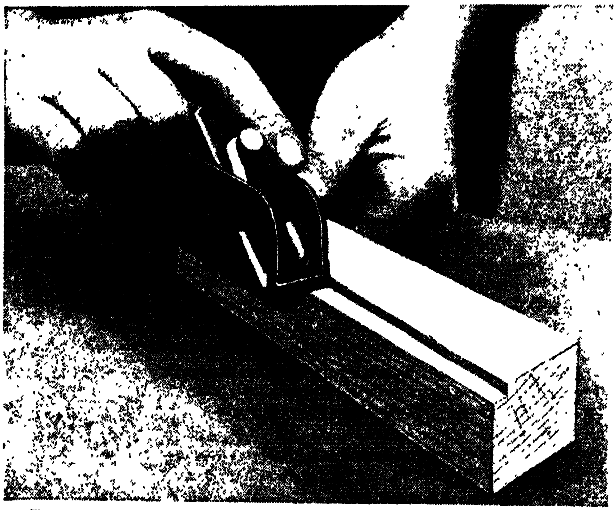


FIG. 31.—CUTTING SMALL REBATE WITH BULLNOSE-PLANE.
This is an extremely handy tool for small work.

Sometimes it is an advantage to fix a strip of wood with a straight edge along the line of the rebate. The rebate plane can then be pressed up against this, so ensuring accuracy. When the rebate runs across the grain it is necessary to cut across the line with a saw to prevent the grain from splintering out, at any rate when the wood plane is used. It is unnecessary when the metal plane is used because this is provided with a spur at the side

which cuts the grain in front of the cutter. Draw the plane backwards a couple of strokes first to make sure the grain is cut. For working *with* the grain the spur is put into a neutral position.

PLOUGH

To do much serious furniture-making a grooving plane or plough is essential. It is needed for working grooves, for panels, etc. The full size plough, wood or metal,

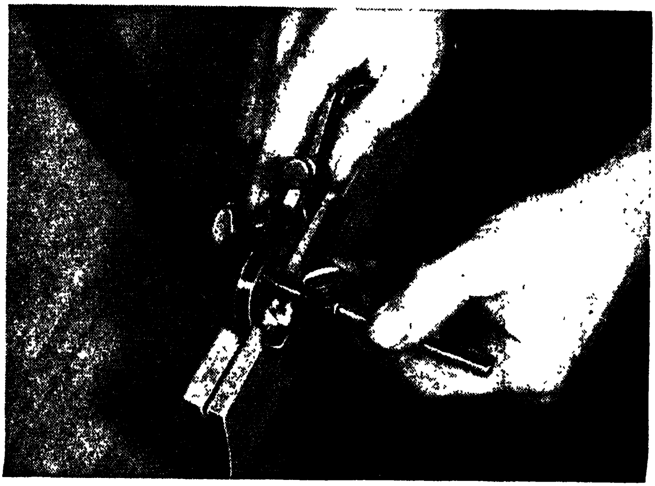


FIG. 32.—WORKING A GROOVE WITH THE SMALL GROOVING PLANE.

will cut grooves from $\frac{1}{8}$ in. up to $\frac{7}{8}$ in., but most work can be done with the small grooving plane which works grooves $\frac{1}{8}$ in., $\frac{3}{16}$ in., and $\frac{1}{4}$ in. wide. It is shown in use in Fig. 32. When using the tool the cutter should be set to remove the required thickness of shaving, and the depth stop set so that the plough ceases to cut when the depth is reached. The fence is then set so that the groove will be cut at the predetermined distance from the side.

Start working at the far end of the work, and bring the plough a little farther back at each subsequent stroke. In this way the plough runs into the groove already made, and it is less likely to drift. In any case keep the fence pressed close up against the wood, and be sure to hold it upright.

ROUTER

This is needed chiefly for making or trimming grooves and depressions in positions in which the plough cannot

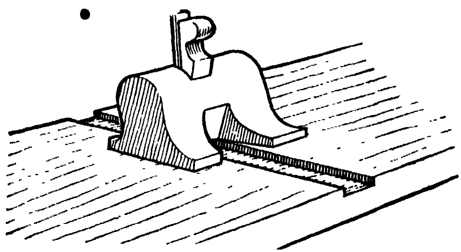


FIG. 33.—USING ROUTER TO MAKE BOTTOM OF GROOVE LEVEL.

be used. For instance, a groove can be made across the grain in the middle of a board. The router can be either of wood or metal, the former having its cutter (a plough cutter or chisel) set at a high angle so that it has more of a scraping than a cutting action. The metal router cutter is cranked so that its cutting edge is almost flat on the wood.

Fig. 33 shows the wood router being used for making a groove of equal depth throughout. In work like this the sides of the groove would be sawn down to nearly the finished depth. A chisel is then used to remove the bulk of the waste, and finally the router is worked back and forth. Work in from each end so that the corners are not broken out. Things are rather more complicated

when the groove is stopped at one end because the saw cannot be taken right through. The best plan is to chop a notch close up to the stop, as shown in Fig. 34, so that the end of the saw can run into this. Note that the position of the groove is cut in with a chisel and square, and that a small sloping groove is cut with the chisel on the waste side (see *A*). This forms a channel in which the saw can run, thus ensuring accuracy. Afterwards the chiselling and routing is carried out as before.

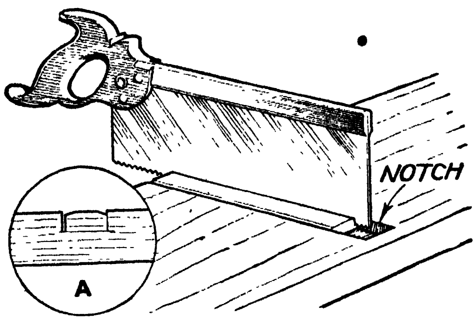


FIG. 34.—SAWING IN SIDES OF STOPPED GROOVE.
Note that saw runs out into a notch.

MOULDING PLANES

These need be bought only as occasion requires. Various patterns are available. Some are held upright, whilst others have to be at an angle as in Fig. 35. Generally the front of the plane has a line scribed upon it, this being vertical when the plane is in use. When using the plane, start at the far end of the work with a few short strokes, and bring it back a little farther at each subsequent cut. This helps to prevent the tool from running off the edge, though it is essential to keep the fence close up to the wood. When working across the grain, cut in first with the gauge to prevent the grain from splintering.

Some moulding planes have no fence, rounds and hollows for instance, and the angle at which these are used is a matter of judgment. For cross-grain work the plane can be taken in from each edge. To start a round plane when making a hollow moulding around a top, plane a plain chamfer with the ordinary bench plane first. This provides a suitable surface, on which the moulding

FIG. 35.—HOW A MOULDING PLANE IS USED.
Note the angle at which it is held.

plane can work. Mouldings can also be worked with the scratch as in Fig. 63.

THE SCRAPER

This has something in common with the plane in that it removes shavings, but differs in that it does not provide any means of trueing a surface. It is used entirely for cleaning up. A plane, no matter how finely set, is bound to leave a number of "waves," due to the shape of the

cutter, and the scraper is used to take these out. Furthermore, some woods have difficult grain, which is liable to tear out even when the back-iron is set close, and the scraper, taking an extremely fine shaving, can be used to take out tears left by the plane. Then, again, for cleaning up veneered surfaces the scraper is essential, since the plane would take too coarse a shaving.

The successful use of the scraper depends primarily

Fig. 36.—How Scraper is Used to Clean up Panel.

It is held obliquely when working over a cross-banding to reduce risk of tearing out of the grain.

upon its correct sharpening. Merely to remove dust is useless. It should take off shavings just like a plane, except that they are extremely fine.

Choose a scraper of medium thickness. If too thick, it will require a great deal of exertion to keep bent (a scraper is bent slightly in use by the thumbs as in Fig. 36), which will prove tiring. On the other hand, a thin scraper will rapidly become hot and burn the thumbs. It is inevitable that any scraper will become hot in use (a cabinet-maker always has hard blisters on his thumbs), but a thin one is

almost unbearable. If the thickness of a number of scrapers is examined, it is simple to select one of medium gauge. Somewhere in the region of $\frac{3}{64}$ in. is about right.

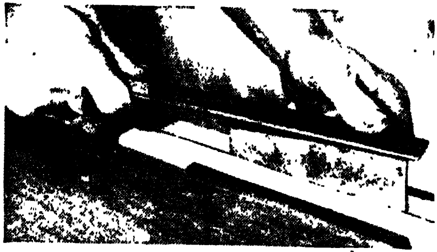
The cutting edge is obtained by turning up a burr as at *F*, Fig. 37, and to enable this to be done the edges must first be made square and smooth. Fixing the scraper in the vice, rub down each long edge with a flat file as at *A*. This will make it true, but the file-marks must be got rid of by rubbing on the stone. If it is worked on the edge of the stone with the cover opened slightly as at *B*, there will be a good guide for holding it upright. It should be grasped with a piece of rag to prevent an accident. To get rid of the inevitable ragged burr the sides are now rubbed down (*C*), the scraper being held perfectly flat on the stone. Afterwards a few rubs can again be given on the edge.

The actual cutting burr is now turned up by using a hard steel instrument such as a gouge. The scraper should be placed on the bench with the edge overhanging about $\frac{1}{4}$ in., and a sharp stroke made with the gouge first in one direction, then in the other as at *E*, the gouge being held a few degrees out of the vertical. If the thumb is drawn *across* the edge, the turned-up burr will be apparent. All four edges are treated in the same way.

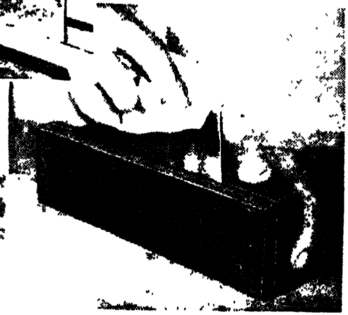
After being in use for a time the edges will lose their keenness and will require to be turned again. To do this the scraper is held flat and the gouge drawn along each side in turn as at *D*, the blade being held perfectly flat. The turning process is then repeated as at *E*. This rubbing down and turning with the gouge can be done several times, until it fails to produce a keen edge, after which the scraper must be again rubbed down with file and stone.

Normally the scraper can be held at right angles with the grain, but if the grain is specially difficult, or if there

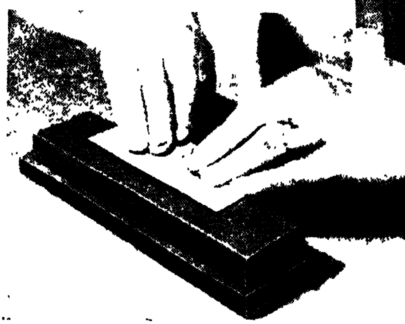
FIG. 37.—STAGES IN SHARPENING THE SCRAPER.



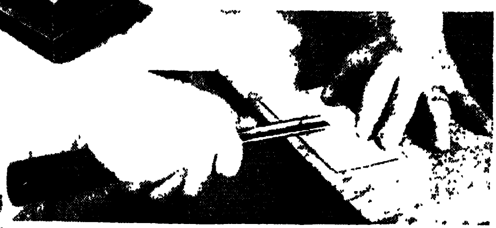
A. Filing the edge.



B. Rubbing edge on the oilstone.

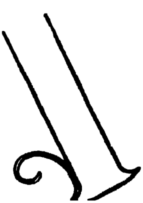


C. Removing the burr.



D. Rubbing down side with gouge.

E. Turning edge with gouge.



F. Diagram showing how scraper works.

is a cross-banding or inlay, it is advisable to hold it at an angle as shown in Fig. 36.

THE SPOKESHAVE AND RASP

THE SPOKESHAVE

The spokeshave is a sort of plane, since it removes shavings similarly to the latter, but it is used for shaped

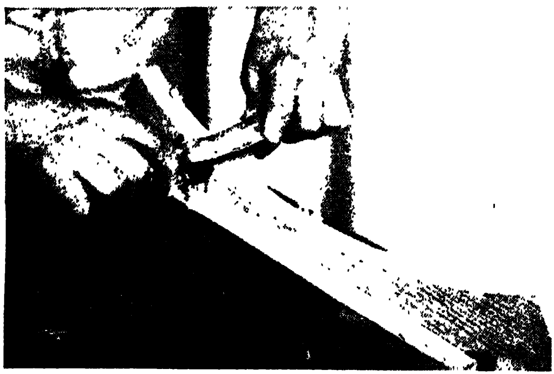


FIG. 38.—THE WOOD SPOKESHAVE IN USE.
The tool should always be worked *into* the grain

surfaces. Two kinds are available, those of wood and those of metal, and each can be obtained with either a

FIG. 39.—USE OF THE SPOKESHAVE.
How grain affects direction in which the spokeshave is worked.

flat face (used mainly for convex shapes) or a round face (for cleaning up concave surfaces). Of the two, the

writer prefers the wooden kind, though the choice is mainly a personal matter.

Fig. 38 shows the wooden type in use. The important point to watch is the direction of the grain, because the tool is liable to cause the grain to tear out badly if worked

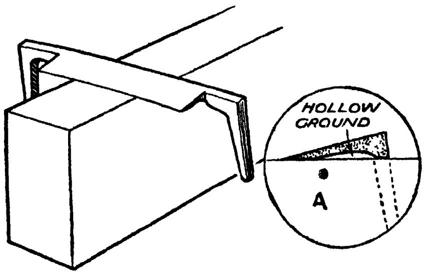


FIG. 40.—SHARPENING SPOKESHAVE CUTTER.

against it. Fig. 39 shows the idea. To sharpen the cutter, either a stone slip may be used, or the usual oil-stone must be turned on edge as in Fig. 40. The cutter is ground hollow, and it should be held flat on the stone as at *A*. Afterwards the burr can be rubbed off, keeping the face of the blade *flat*. Cutters of the metal spoke-shave are sharpened like an ordinary plane-iron, but, as it is rather small to grip, a holder such as that shown in Fig. 41 should be made. The saw-kerf holds the cutter purely by friction.

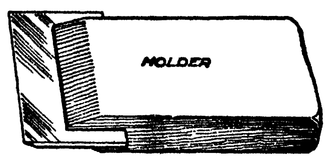


FIG. 41.—HOLDER FOR SPOKESHAVE CUTTER.

RASPS AND FILES

These are useful for cleaning up some curved surfaces. For instance, certain concave shapes are so sharp that the spokeshave cannot enter them, and here a file is invaluable

to remove saw-marks. Scratches left by the file can be taken out with the scraper and glasspaper. Examples of both file and rasp are given in Fig 42. Model-makers especially will find them handy, particularly when making the hull of a model ship.

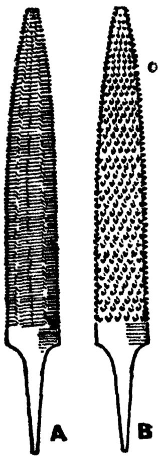


FIG. 42.
A. Wood File.
B. Wood Rasp.

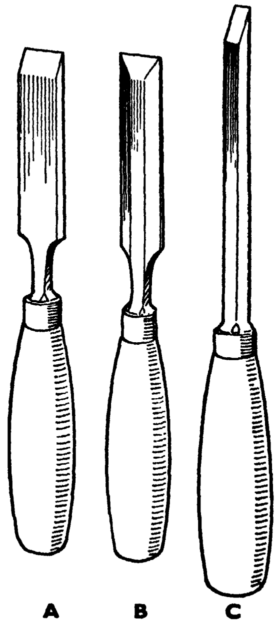


FIG. 43.—TYPES OF CHISELS.
A. Firmer. *B.* Bevelled edge.
C. Sash mortise.

CHISELS

For all-round purposes what is known as the firmer-chisel is the most useful. It is sturdily built so that it will stand up to heavy use, such as chopping out, when it has to be struck with the mallet, and it can be used for paring, though the more delicate bevelled-edge chisel is more convenient for the latter operation. Both are shown in Fig. 43. In the preliminary kit the firmer-chisel is

certainly advisable; a bevelled-edge chisel can be bought later when finer work is done—though even for this it is not essential.

The firmer-chisel is sharpened similarly to the plane-iron, though, being narrow, it should not be worked continuously in the middle of the stone, as this will rapidly cause the latter to become hollow. Hold it with the bevel flat on

FIG. 44.—HOW CHISEL IS HELD WHEN SHARPENING.
It is afterwards reversed *flat* on the stone to remove the burr.

the stone, and then raise the handle a trifle so that a new bevel is formed. The correct angle is from 30 to 35 degrees. Do not raise the handle unduly, as this will create a thick point, with the result that it will lose much of its keenness. In practice it will be found that the bevelled-edge type can have a lower angle, because the chisel is used only for paring work. For the firmer type a rather more substantial edge is needed, owing to the heavier type of work for which it is required. The sharpening is shown in Fig. 44. When a burr has been

here that the most useful size is $\frac{5}{16}$ in. The reason for this is that most wood to be mortised is $\frac{7}{8}$ in. thick, and, as the mortise should be as near one-third of the thickness as possible, this size most nearly fulfils that requirement.

Various Tools

TOOLS FOR BORING

A brace is the first essential for this work, and for most work the plain type with about an 8-in. sweep will do everything required. Those who care to go to the extra expense might with advantage obtain a ratchet brace, because this is so handy when working in a corner. A brace of this kind is shown in Fig. 1. It is important that it be held upright, and a good plan for a start is to place a square on the bench at the side as a guide as in Fig. 47. One point to note is that it is easier to tell whether a brace leans to the left or right than whether it is leaning away from or towards one. Consequently, for such jobs as dowelling, where it would be fatal for the bit to run out at the side, the worker should stand at the end. Should the hole lean a trifle along the length of the work it would not be so disastrous, though it would obviously be better for it to be perfectly upright.

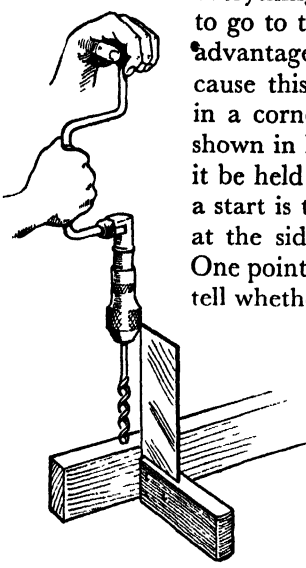


Fig. 47.—Use of Square when Boring.

One of the most useful bits is the $\frac{3}{8}$-in. twist-bit, because is is needed in dowelling. A smaller one, $\frac{1}{4}$-in., is handy

when mortising to clear out the bulk of the waste before chopping. When a number of holes have to be bored to the same depth, either a piece of paper can be stuck to the bit as a guide (Fig. 48) or a depth-gauge can be fixed on as in Fig. 49. The latter is easily made from two pieces of wood screwed together, with a centre notch to hold the bit.

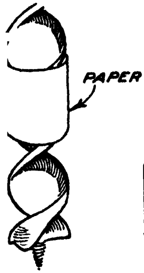


Fig. 48.

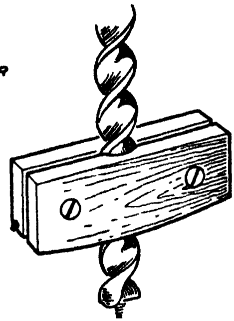


Fig. 49.

Fig. 48.—Paper Stuck to Bit to Act as Depth-Gauge.

Fig. 49.—Depth-Gauge Fixed to Bit.

Providing care is taken and nails are avoided, a twist-bit will last a long time without sharpening—in fact, it should not be sharpened more often than necessary, because once the nickers have been filed down the bit is useless. Fig. 50 shows the two operations of sharpening the nickers and the cutters. A file with a safe edge should be used, to avoid damaging the thread. At all costs avoid dubbing over.

Fig. 50.—Sharpening Twist-Bit.
Filing the nickers. *B.* Cutter being filed.

Centre-bits are suitable only for boring comparatively shallow holes. For deep holes in end grain they are useless, because they are liable to drift with the grain, since there is no spiral portion, as in a twist-bit, to keep them true. The sharpening is similar. Fig. 51 shows the filing line. Note especially the angle of the nicker. If this is incorrect the grain is liable to tear out.

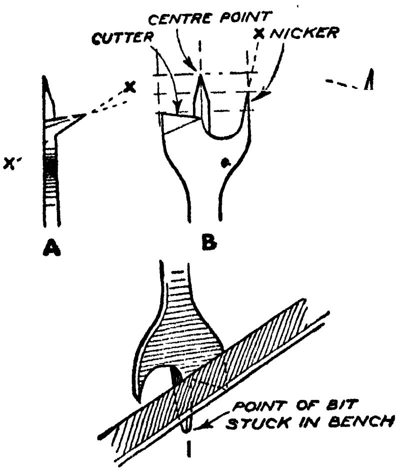


FIG. 51.—SHARPENING CENTRE-BIT.

A. Side view of cutter. *B.* Front view.
C. Side view of nicker.
D. How file sharpens cutter.
The dotted lines show the sharpening angles.

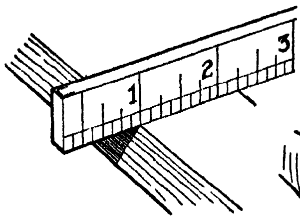
A shell-bit is handy for boring screw-holes. A size of about $\frac{1}{8}$ in. is the most useful. A countersink is also needed. This seldom requires sharpening, but a few rubs with a small, flat file and a rat-tail file soon restore its edge.

Another invaluable tool for use in screwing is the bradawl. It costs little, and one or two different sizes can be kept. In use the blade should point across the grain. To sharpen it the oilstone can be used, or if gashed it can first be rubbed down with a file. Model-makers will find an Archimedean drill handy, though it will not be required to any great extent in ordinary woodwork.

THE OILSTONE

An oilstone is an essential part of the kit. It can be obtained without a case, the latter being made by the

worker himself. To prevent it from shifting about, a piece of leather can be glued at each end underneath. Do not try to economise unduly on the stone. A cheap one is generally useless—or rapidly becomes so. An "Indian" or a "Carborundum" stone is excellent. "Washita" stones, too, are good, though one occasionally comes across one which becomes hard and loses its cut. A combination stone is useful, the coarse side being handy for rubbing down tools which have been gashed.



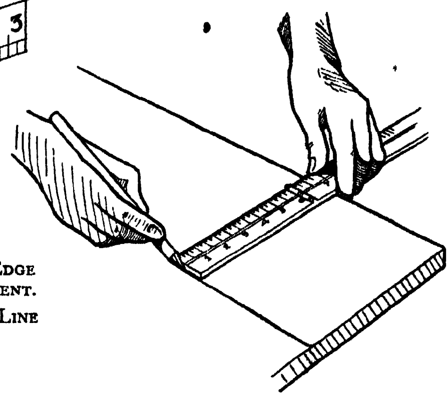


FIG. 52 (*left*).—RULE ON EDGE TO GIVE EXACT MEASUREMENT.

FIG. 53 (*right*).—MARKING LINE PARALLEL WITH EDGE.

Use a good-quality, fairly thin oil, and wipe the stone after use. A slip is needed for sharpening some gouges, and is handy also for the spokeshave.

MARKING AND TESTING TOOLS

A 2-ft. folding rule is the most convenient for general use. When marking a size it should be turned on edge, so that the calibrations actually touch the wood as in Fig. 52. Long lengths of timber can be marked out parallel from one straight edge by using the index finger of the left hand as a gauge as in Fig. 53, though such marking is only approximate. It is near enough for

preliminary sawing. Fig. 54 shows how a board can be divided into an odd number of equal parts by holding the rule at an angle.

A square is needed for both marking and testing, and

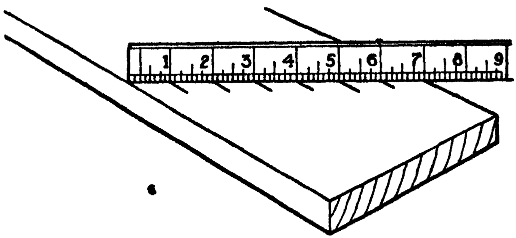


FIG. 54.—DIVIDING WITH RULE.
It can be held diagonally to divide board into odd number of equal parts.

a point to note about its use is that the butt should always bear against either the face side or the face edge. For instance, if a shoulder has to be squared round on to all four sides, the square should be used as shown in

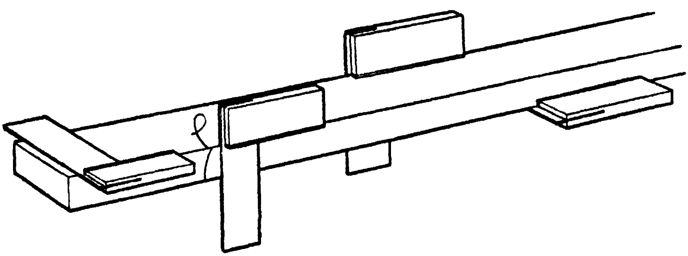


FIG. 55.—USING SQUARE AGAINST FACE SIDE OR EDGE.

Fig. 55. In this way the marks will meet exactly. A large square is useful for big work, and this can be made by the reader as shown in Fig. 56. A similar tool to the square is the set-mitre used for testing mitres. The blade is set at 45 degrees.

A gauge is essential for accurate work. Two kinds are available, the marking and the cutting gauge. The latter is recommended because it can be used *across* the grain as well as with it. Fig. 57 shows how it is held. The index finger passes over the top of the fence, and the second finger maintains a steady inward pressure to prevent it from drifting from the edge. The thumb is behind and presses forwards. When working *with* the grain, be careful to avoid allowing the gauge to run with the grain. The inward pressure of the second finger helps to prevent this.

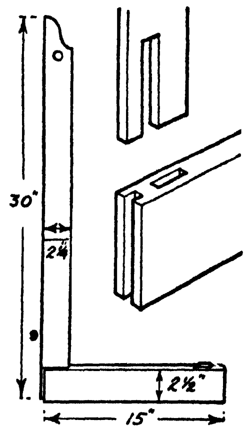


FIG. 56.—EASILY MADE LARGE WOOD SQUARE.

FIG. 57.—USE OF THE CUTTING GAUGE.
This can be used across the grain as here, as well as *with* it.

When mortising, a mortise gauge is needed. This is a similar tool, but is provided with a second adjustable marker as shown in Fig. 58. In use first the markers are set to the width of the chisel being used, and then the fence is set so that the two are central on the wood.

OTHER TOOLS

The hammer is a fairly obvious requirement. The Warrington pattern with flat pene is recommended. A punch is also useful for sinking nails. A medium size of screw-driver is best to begin with. A small one can

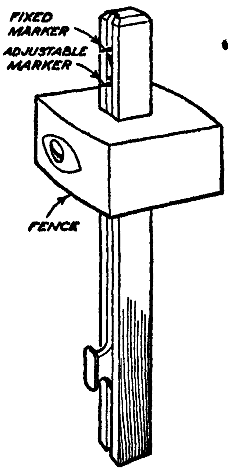


FIG. 58.—THE MORTISE GAUGE.

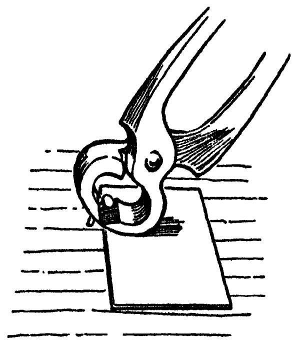


FIG. 59.—USING PINCERS. Scraper placed beneath prevents wood being bruised.

be obtained later for driving in small screws. Pincers are needed when nailing, and a handy note here is that, to avoid bruising the wood, a piece of flat steel such as a scraper can be placed underneath as shown in Fig. 59. A mallet is required for striking chisels, as this will not fray out the handles. The cork rubber is required when glasspapering, because, if the glasspaper is held in the

hand only, it will not take out any inequalities, and the corners are liable to be dubbed over. Fig. 60 shows how

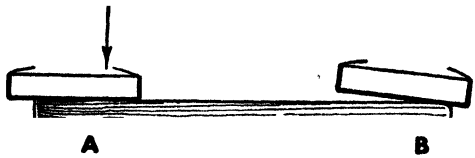


FIG. 60.—USE OF CORK RUBBER.

A. Correct use. Note where pressure is applied.
B. Faulty use showing ends dubbed over.

it should (and should not) be used.

Mention should be made of the various types of cramps needed when glueing up, and to hold down wood whilst being worked. A variety is shown in Fig. 61. A couple of sash cramps are invaluable when assembling doors, frames, glued joints, and so on. Thumbscrews are handy for small work, and handscrews or G cramps for larger pieces.

There is a variety of other tools and appliances which the reader can make for himself as they are needed. For mitreing mouldings the mitre-block for small work and the mitre-box for large work are really essential. They are shown in Fig. 62. This illustration also shows a mitre shooting-board used for trimming mitres after sawing.

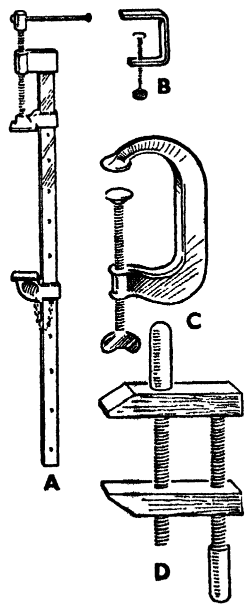


FIG. 61.—TYPES OF CRAMPS.

A. Sash cramp.
B. Thumbscrew.
C. G cramp.
D. Handscrew.

Finally there is the scratch-tool shown in Fig. 63. With it mouldings and grooves can be worked. It con-

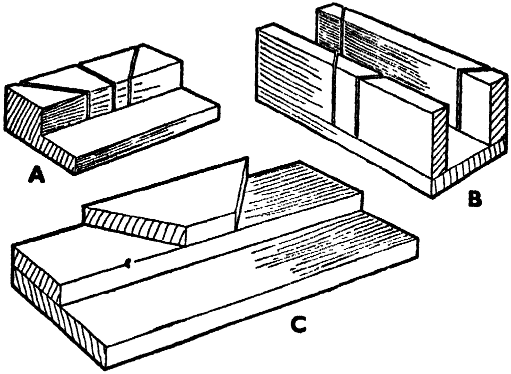


FIG. 62.—APPLIANCES FOR MITREING.
A. Mitre-block. *B.* Mitre-box. *C.* Mitre shooting-board.

sists of a piece of hardwood about 8 in. long cut to the shape shown, and with a saw-cut through the end down

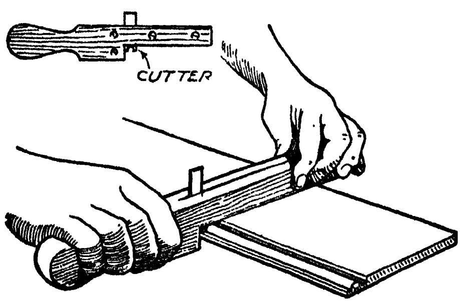


FIG. 63.—SCRATCH-TOOL IN USE.

to just past the notch. Screws are driven in to enable the cutter to be held firmly in any position. The cutter can be a piece of thin steel such as could be cut from an

old saw-blade. This is filed to the reverse of the shape required. The tool is worked back and forth, the notch being held tightly against the edge of the wood. Its action is that of scratching or scraping. There is no bevel on the cutter. It is filed square at the end.

CHAPTER II

JOINTS AND THEIR APPLICATION

Nailed and Screwed Joints

NAILING

The simplest form of joint is the plain butted type nailed together, possibly with glue to strengthen it. It is not used to any great extent in the better form of cabinet work, but it is very useful for simpler pieces. For garden woodwork and rougher work it is essential.

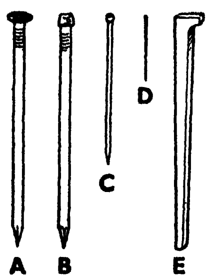


Fig. 64.—Types of Nails.

A. French nail.
B. Oval wire nail.
C. Panel pin.
D. Veneer pin.
E. Cut nail.

We may first consider the kinds of nails in general use. There is first the round french nail with round, flat head (*A*, Fig. 64), usually sold in sizes from 1 in. up to 6 in. They hold well, and are suitable for the rougher type of work, but, as the heads are comparatively large, they are unsuitable for cabinet work. A rather better form in this respect is the oval wire nail (*B*). It is not so liable to split the wood (it is driven in with the oval *with* the grain), and the head is much smaller. The most useful for furniture-making, however, is the panel pin shown at *C*. It is comparatively thin and, the head being small, it shows little when punched in. The veneer pin (*D*) is a smaller edition of this, $\frac{3}{8}$ in. or $\frac{1}{2}$ in. long, and is very fine, with a small head. It is handy for tacking on small mouldings and for model work. At the other end of the scale is the cut nail, *E*, used for nailing down floorboards, matching, and so on. All these are sold by weight, and the reader is

advised to make a nail-box with divisions so that he can see at a glance which size of nail is most suitable for the work in hand.

Although nailing seems an obvious sort of thing, there are right and wrong ways of doing it, and there are undoubtedly pitfalls. For instance, there is the old danger

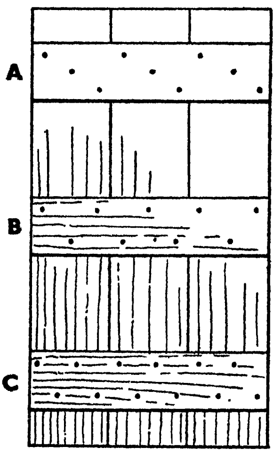


FIG. 65.—NAILS STAGGERED TO AVOID SPLITTING.

A and *B*. Three-nail arrangement.
C. Four-nail spacing.

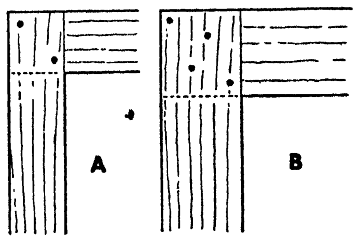


FIG. 66.—NAILING FRAMEWORK CORNERS.
A. Two-nail. *B*. Four-nail.

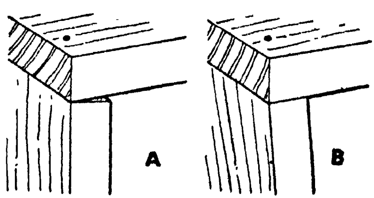


FIG. 67.—FAULTS IN NAILING.
There is either a gap as at *A*, or parts are out of square (*B*).

of splitting when nails are driven in at the end of a board, especially in soft wood. In such a case it is always a safeguard to bore the holes first, using a bradawl or drill of slightly smaller diameter than that of the nail.

This liability of wood to split has also to be considered in another connection. For instance, when a batten is being nailed across a number of boards, the nails should be staggered as shown in Fig. 65. *A* is the best arrange-

ment, in that none of the nails lines up with any others in either the batten or the boards beneath. *B* has an advantage, in that all the nails are near the edge, so preventing any tendency for the edges to curl. When four nails can be used, they can be placed as at *C*. The same principle is followed in the corner joints shown in Fig. 66.

When a simple box is being made with nailed corners, it is important that the edges are square. Otherwise there will be a gap at one side as at *A*, Fig. 67, which is weak, apart from being unsightly, or the parts will fit together out of square as at *B*. The strength of such a

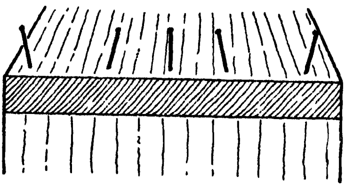


Fig. 68.—Nails Dovetailed to give Maximum Strength.

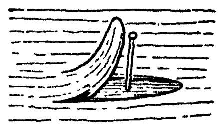


Fig. 69.—Secret Nailing.

joint can be increased by "dovetailing" the nails—that is, driving them in askew in alternate directions. This is shown clearly in Fig. 68. The parts are then better able to resist a direct pull apart. For rough work, in which the parts are put together in their thickness, long nails can be used so that they can be clenched at the back. Secret nailing is sometimes handy. A cut is made with a chisel to raise a chip, as in Fig. 69. The nail is driven in, punched home, and the chip glued down.

SCREWING

Screws are often handy for joining pieces together. They are obtainable in various forms and metals, but the most commonly used are the countersunk form and the

roundhead shown in Fig. 70. This illustration shows how the length of the two kinds is calculated. In all cases the wood which holds the shank should be bored with an easy clearance fit. It should never be tight. It is only

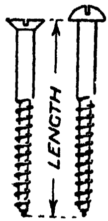


FIG. 70.—HOW LENGTH OF SCREWS IS CALCULATED.

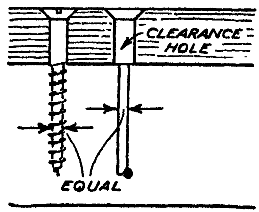


FIG. 71.—SIZES OF HOLES BORED WHEN SCREWING.

the wood into which the screw portion is driven that should be tight. The hole should be about the size of the diameter of the centre portion, so that the spiral flange or screw part bites into the wood and so holds. This is shown clearly in Fig. 71.

In the ordinary way there is no difficulty about countersinking a screw, but sometimes a thick piece of wood has to be screwed to a comparatively thin piece. For example a table-top is often screwed on, and to drive the screws right through the rails would necessitate long screws. The method known as pocket screwing is therefore usually adopted. This is shown in Fig. 72, in which a cut is made with a gouge in the inside of the rail, enabling

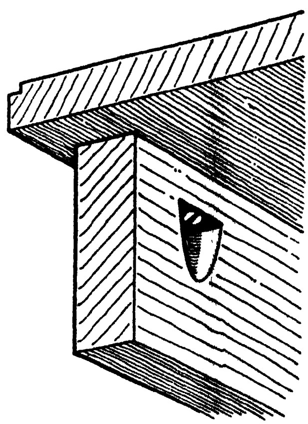


FIG. 72.—METHOD OF POCKET SCREWING.

a shorter screw to be used. To do this the clearance hole is bored at an angle from the top edge of the rail, so that it emerges inside. The gouge-cut is then made deep enough to take the head of the screw.

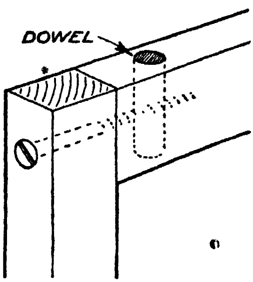


FIG. 73.—METHOD OF OBTAINING STRENGTH WHEN SCREWING.

When it can be avoided, screws should not be driven into end grain, especially in soft woods. They have little strength, because the short grain between the screw thread is liable to crumble. If it cannot be avoided, the hint in Fig. 73 can often be followed with advantage. A dowel (sometimes two) is bored into the wood so that the screw, in being driven through it, has suitable grain to which to grip.

GLUED JOINTS

Glued joints are used when two or more pieces are glued together side by side in order to build up to a

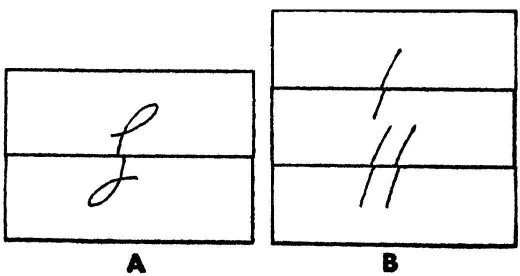


FIG. 74.—HOW JOINTS ARE MARKED OUT.

required width. In the best form the two parts are planed to make a perfect joint, and are "rubbed" together—that is, the one piece is fixed in the vice, the surfaces

are glued, and the upper piece is placed in position and rubbed back and forth so that all surplus glue is squeezed out. The advantage of this is that the parts retain their natural shape. It is satisfactory for joints up to about 3 ft. in length. For longer work, however, it is desirable to use cramps, and in this case the joint is shot a trifle hollow, and one or more cramps are put on in the centre. In this way the ends are naturally pressed tightly together—a desirable feature, because the ends are the most vulnerable points. It is a mistake to plane the joints round and put on cramps at the ends, because there is then the tendency for them to spring apart.

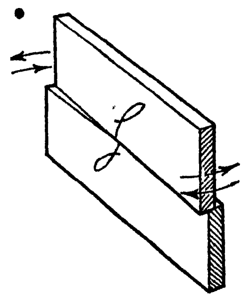


FIG. 75.—TESTING JOINT BY "SWIVELLING."

The first step is to mark the joining edges as in Fig. 74, so that the parts can be replaced in the correct positions. The joints can be shot either in the vice or on the shooting-board. In the former case a square should be used to test the edges to ensure the two pieces being in alignment. When the shooting-board is used, the one piece is planed with the face side uppermost, and the other with the face side downwards. In this way they will fit together square.

If the joint is held to the light, it can be seen whether it is making a close fit; but in any case the upper piece should be swivelled back and forth as in Fig. 75. A round joint will merely pivot at the centre, whereas a correctly planed one will give friction at the ends, showing that they are touching.

In all cases when Scotch glue is used the joints should be heated to prevent the glue from chilling, and, when rubbing the upper piece, the hands should be kept low

at the ends, so that the joint is not broken. This is shown in Fig. 76. When the glue is drying, the joints can be

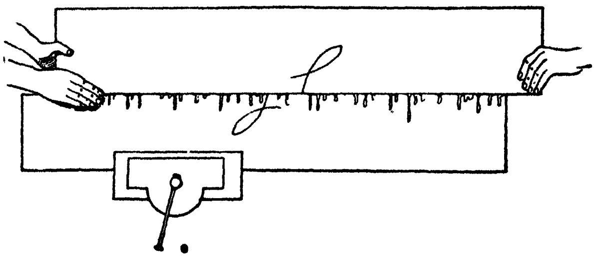


FIG. 76.—HOW LONG JOINT IS RUBBED.

stacked as shown in Fig. 77, each resting across its entire width upon a batten. At least twelve hours should elapse before the work is cleaned up.

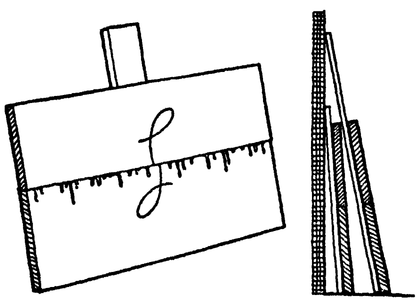


FIG. 77.—STACKING JOINTS WHILST DRYING.

Fig. 78 shows a cramped joint being glued up. It is advisable to test with the straight-edge as shown, because if the cramp is not put on correctly, it may tend to pull the joint out of alignment. If the upper piece leans forward, the cramp should be put farther back.

Thin wood of, say, $\frac{1}{8}$ in. thickness should be planed on the shooting-board, because otherwise it is difficult to

keep the edge square. When glueing up, two battens are laid on the bench, a sheet of paper is placed over them,

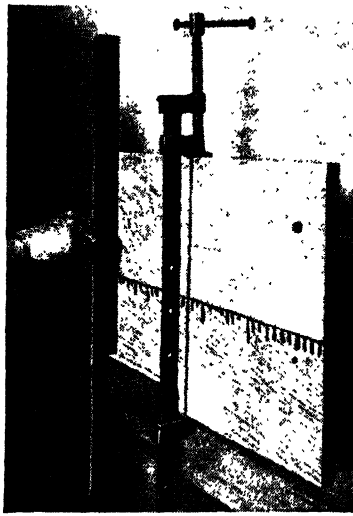


FIG. 78.—TESTING CRAMPED JOINT WITH STRAIGHT-EDGE.

and the joint rubbed together flat as in Fig. 79. If cramps are required, as in the case of a long joint, battens

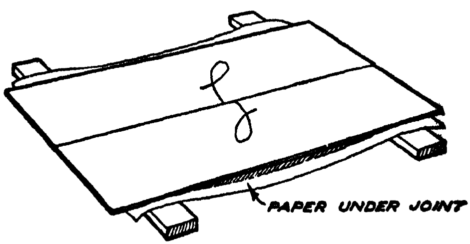


FIG. 79.—ASSEMBLING JOINT IN THIN WOOD.

must be put on with thumbscrews at both sides to prevent buckling. This is shown in Fig. 80.

For such wood as oak, which does not hold the glue

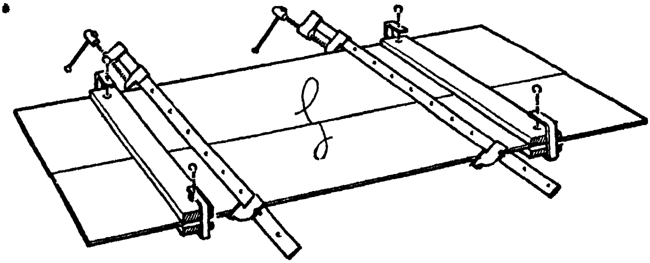


FIG. 80.—CRAMPING UP JOINT IN THIN WOOD.

specially well, dowels can be used. To get the holes exactly opposite, the two pieces are fixed together with thumbscrews and the marks squared across both edges as in Fig. 81. A cross mark is made at each with the

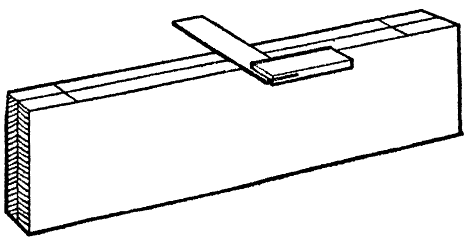


FIG. 81.—SQUARING-IN POSITIONS OF DOWELS.

gauge worked from the face side and the holes bored and slightly countersunk. The dowels are then glued into the one piece and the length of the projecting dowels is tested with a pencil dropped into the holes and then held against the dowels. The countersinking allows for

the surplus glue which is bound to accumulate at the bottom. If the tops of the dowels are rounded, they will more easily enter their holes. Another point is that a saw-cut made along their length enables the glue in the holes to escape. Otherwise it will be trapped at the bottom and prevent the joint from going home. These details are shown in Fig. 82.

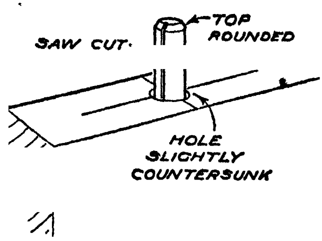


FIG. 82.—DETAIL OF DOWEL.

HALVED JOINTS

These occur in practically every branch of woodwork, and have the advantage of simplicity. Some varieties require the use of the saw only, whilst in others the waste is pared away with the chisel. In no case is any chopping out required.

In Fig. 83 is a halved joint used for joining two pieces at right angles, the joint occurring at the centre. The width of the wood is marked across with chisel and square as at *A*, and returned at the edges with pencil marks. To mark the depth, the gauge is used from the face side in both cases, so that the two parts are bound to fit together level even if the gauge is not set exactly to the middle. The sides of the groove are cut in with the saw, and, to provide a channel in which the saw can run, a small sloping groove is made with the chisel on the waste side. After sawing the sides the waste is chiselled first from one side (left at *C*) and then from the other as shown by the arrows. The photograph in Fig. 45, Chapter I, shows the final paring, the chisel being given a slicing movement.

The corner halved joint in Fig. 84 needs the use of the

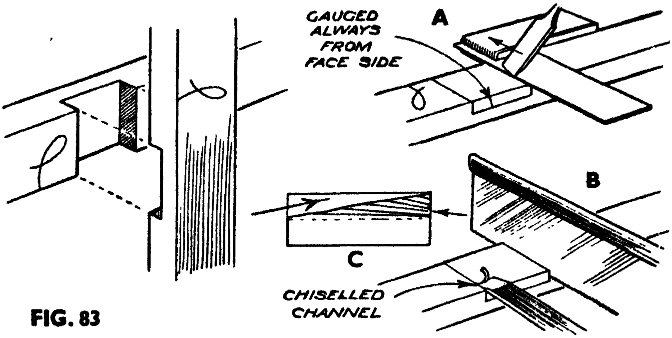


FIG. 83

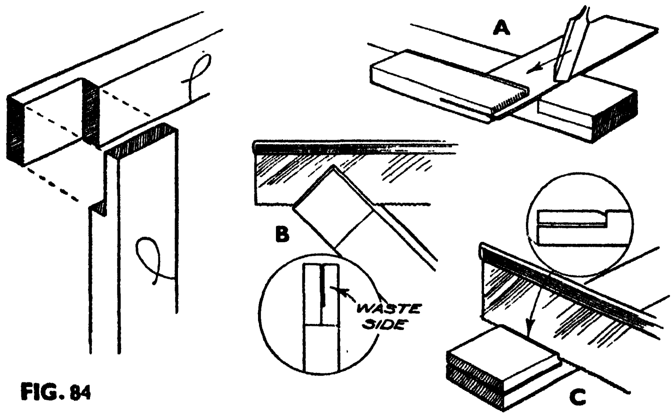


FIG. 84

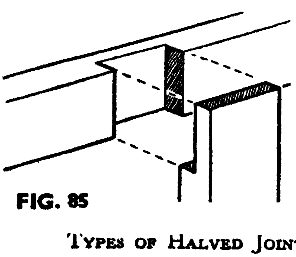


FIG. 85

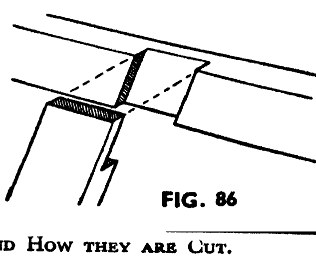


FIG. 86

TYPES OF HALVED JOINTS AND HOW THEY ARE CUT.

When the waste is sawn away the saw is held to the side of the line so that the latter is left in.

saw only for cutting. It is marked out with chisel and square as at *A*, a small extra allowance being made in the length for trimming. As before, the line of the halving is gauged from the face side only, and when being cut the saw is worked at the side of the line as shown inset at *B*. It is best to fix the wood in the vice at an angle and cut down as far as the diagonal. It can then be reversed, this time upright, and the cut completed. *C* shows the shoulder being sawn. Note the sloping groove chiselled on the waste side to provide a channel in which the saw can run. The parts should fit direct from the saw, but if any levelling is needed, it can be done with the rasp.

Fig. 85 is a combination of the two joints already given, and Fig. 86 shows a similar joint with the one member set obliquely.

Mortise and Tenon Joints

This is one of the most useful joints in woodwork, because it is used so widely. Doors, frames of all kinds, stands, carcases, and so on all call for it. As a natural consequence there are a great many varieties of it, and, although to give them all would be neither necessary nor desirable in a book of this kind, there are a few with which the home carpenter should make himself familiar.

Its simplest form is shown at *A*, Fig. 87, from which it will be seen that the mortise is cut in to about three quarters of the width of the wood. The thickness (and this applies to practically all mortise and tenon joints) is as near as possible one-third that of the wood. It is used for simple doors, frames, and all similar jobs in which two comparatively narrow pieces are joined together at right angles. Note that the mortise is set down from the top, because otherwise the tenon would be exposed.

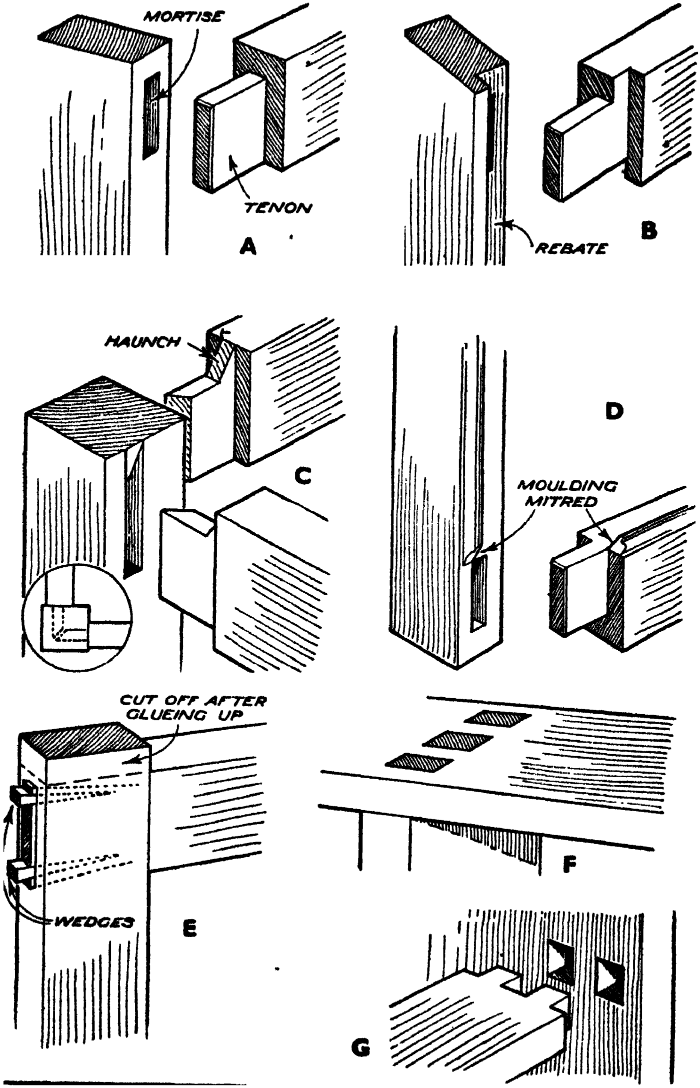

MORTISE
TENON
A
REBATE
B
HAUNCH
C
D
MOULDING
MITRED
CUT OFF AFTER
GLUEING UP
WEDGES
E
F
G

Fig. 87.

A rather more elaborate variation is that at *B*, in which the wood is rebated at the back to hold a panel as in a door. This means that the back shoulder has to be cut longer than the front one by an amount equal to the depth of the rebate. When making it, the rebate is marked out with the gauge, but is not worked until after both mortise and tenon have been cut.

C is similar to that at *A*, but has a haunch at the top to prevent any twisting tendency. As the haunch is tapered, it is invisible at the top. The joint is used when two rails have to be joined to a leg. Note from the inset sketch how the ends of the tenons are cut at an angle so that they have the maximum length.

At *D* the wood is rebated, but a moulding is worked at the front edge. In this case the shoulders are level because the moulding is cut away and mitred. It should be noted that when a door is made the shoulder length is taken from the rebate depth, not from the edge of the moulding.

A joint useful for outdoor work is the through-wedged type at *E*. The mortise is cut extra long at the outer edge, and two saw cuts are made, one at each side of the tenon. After glueing up, a wedge is driven into each so that it is impossible to pull the two apart.

That at *F* is a kind used for joining together a centre partition in a carcase, whilst *G* is the sort of joint for joining a drawer rail to the side of a carcase.

FIG. 87.—VARIOUS FORMS OF MORTISE AND TENON JOINTS.

A. Simple mortise and tenon joint.
B. Joint for rebated framework.
C. Haunched tenons meeting at leg.
D. Framework with mitred moulding worked in the solid.
E. Through tenon wedged at outside.
F. Through tenons for carcase work.
G. Drawer rail joint.

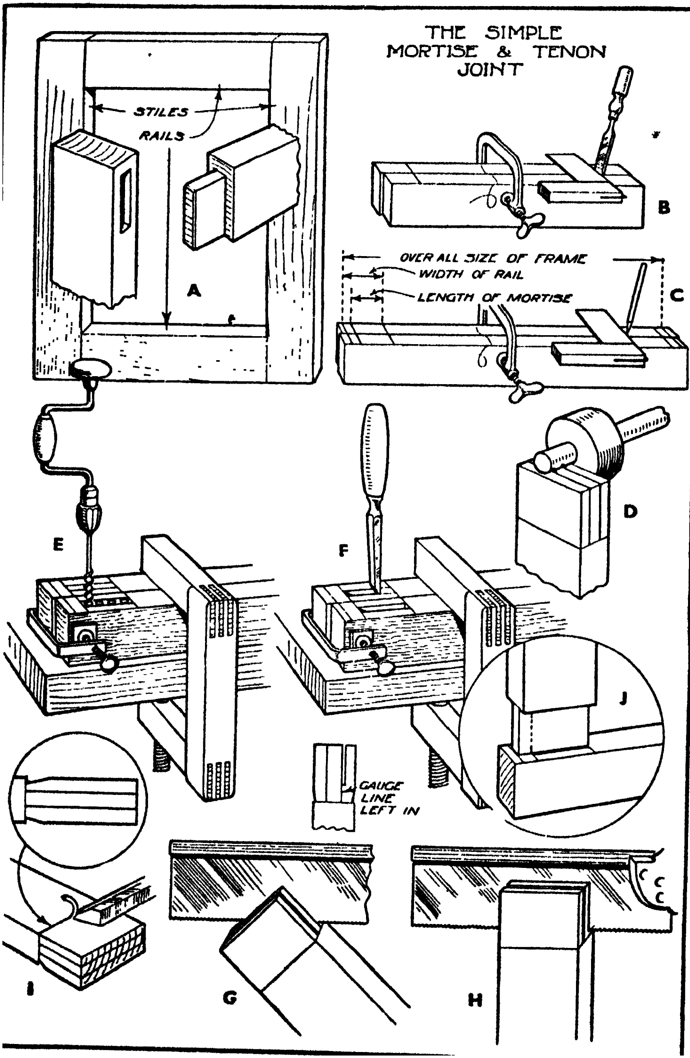

THE SIMPLE MORTISE & TENON JOINT
STILES
RAILS
A
B
OVER ALL SIZE OF FRAME
WIDTH OF RAIL
LENGTH OF MORTISE
C
D
E
F
J
GAUGE LINE LEFT IN
I
G
H

FIG. 88.

MAKING THE SIMPLE MORTISE AND TENON JOINT

To give a practical example we will assume that the door at *A*, Fig. 88, has to be made. Having planed up the wood, the two pieces for the rails are fixed together and the shoulder positions marked out as at *B*. A chisel and square are used, and, after marking both together as shown, they are separated and the marks squared around both individually on all four sides. The stiles follow as at *C*, the marking being similar, except that a pencil is used and the marks are not squared round. A mortise gauge is now set so that the two markers are spaced to the width of chisel being used. In the case of $\frac{7}{8}$-in. wood, a $\frac{5}{16}$-in. chisel is the best. The fence is set so that the two marks are central, and all the parts marked from the face side as at *D*.

Chopping the mortises is shown at *E* and *F*. The two pieces are cramped to the bench, and a thumbscrew is put on at the ends to prevent the wood from splitting. A great deal of the waste is removed by boring, using a bit slightly smaller than the mortise width. The chopping follows as at *F*. The chisel is started at the middle, and is struck with the mallet. It is gradually worked first towards one end, then towards the other, the depth being increased at each cut. The chopping should be stopped short at each end and the waste levered away, after which the ends can be cut in cleanly.

When the tenons are sawn, the wood should be fixed in the vice at an angle, and the cut taken down as far as the diagonal as at *G*. It is then reversed, this time

FIG. 88.—CUTTING MORTISE AND TENON JOINTS FOR A DOOR.

A. Door with joint in detail.
B. Marking the rails.
C. Marking the stiles.
D. Using mortise gauge.
E. Boring away the waste.
F. Chopping the mortises.
G. First stage in sawing tenons.
H. Finishing tenons.
I. Cutting channel at shoulder.
J. Fitting the joint.

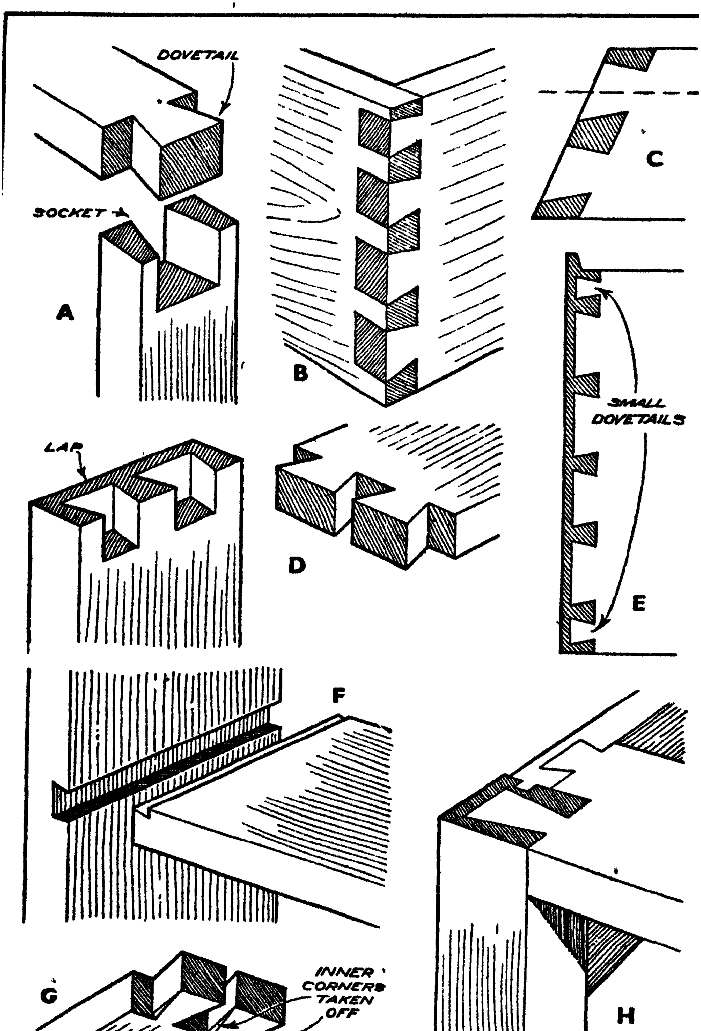

DOVETAIL
SOCKET
A
B
C
SMALL DOVETAILS
E
LAP
D
F
G
INNER CORNERS TAKEN OFF
H

FIG. 89.

upright, and the cut completed as at *H*. Note that the cuts should be made *outside* the gauge lines, so that the last-named are just left in. Before sawing the shoulders, a chisel-cut should be made as at *I*. This forms a channel in which the saw can run.

The last job is fitting the tenons. Each tenon is placed opposite its mortise as at *J*, and a pencil mark made. The waste is then sawn away, and any final fitting completed. A test should be made to see that the rails are square with the stiles, and when the whole thing is tried up, a sight should be taken across the opposite members to see that they are not in winding.

Dovetail Joints

This is a joint of which many amateurs fight shy because of the supposed difficulty of cutting it. Actually it is a straightforward job if gone about in the right way. There are a great many varieties of it, though most of them are merely variations of the simple form. There are only two that need concern us here, because by a little adaptation they can be suited to most jobs. These are the " through " or simple dovetail, and the lapped dovetail.

VARIOUS KINDS OF DOVETAILS

The first of these is shown at *A*, Fig. 89. It consists of one piece, the dovetail, having a sort of reversed wedge

Fig. 89.—Various Forms of Dovetails.

A. Through dovetail.
B. Through dovetails applied to a box.
C. Correct slope when piece with sockets is at an angle.
D. Lapped dovetail.
E. Lapped dovetails for cabinet carcase top.
F. Bare-faced housed dovetail.
G. Corners taken off to ease assembling.
H. Lapped dovetails of table framework.

shape, and the socket which is cut with a notch to hold the dovetail. It can be used for joining together pieces at right angles, and is suitable for all work in which it does not matter if the joint shows. It is the strongest form of joint, and has the advantage that its shape prevents the one piece from being pulled away from the other, quite apart from the grip of the glue. When, then, it is known that a piece of work is liable to stress in one direction, the joint should be arranged so that the wedge-shape resists the stress. The cutting of this joint is dealt with later, and we may therefore pass to its applications.

One of the commonest ways in which it is used is in joining the sides of a box as at *B*. It is simply a series of plain dovetails arranged side by side. Simple cabinet carcases, frames of various kinds, and drawers call for its use. Sometimes one of the joining pieces has to be at an angle as at *C*, and here it should be noted that the slope of the dovetail is set out equally at the sides of a line parallel with the sides of the piece in which the dovetails are cut.

Lapped dovetails are used when the joint requires to be concealed at one side. For example, in a cabinet the top and bottom are usually lap-dovetailed to the sides. In this way they do not show at the sides. They can, of course, be seen at the top, but generally this does not matter, because another top is fixed above. An example of a lapped dovetail is given at *D*. The only difference in the marking out is that the gauge giving the dovetail length is set to the thickness of the wood in which the sockets are cut, less the thickness of the lap. When a cabinet is being made with lap dovetails at the top, it is advisable to cut small dovetails at the side as at *E*, as these prevent any tendency for the cabinet sides to curl outwards in the event of the wood warping.

A bare-faced housed dovetail is given at *F*. These joints are very handy when fixed shelves have to be fitted to a tall bookcase, as they prevent the sides from bulging outwards. The joint at *H* is a lap dovetail as applied to a table framework. The side rail is tenoned to the leg and is glued up. The front rail is then dovetailed in as shown.

In all dovetail joints it is advisable to take off the lower corners as at *G*, to enable them to enter the sockets easily.

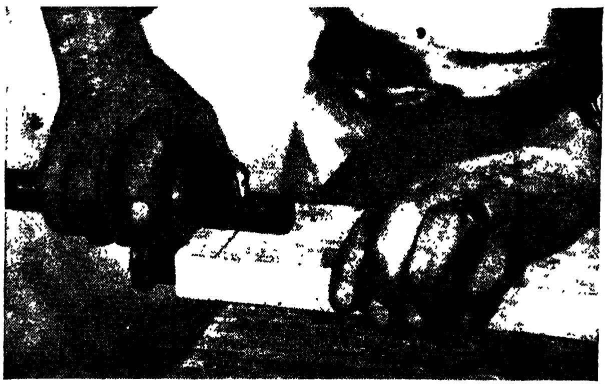


Fig. 90.—Gauging the Ends.
The gauge is set to the thickness of the wood.

In the through dovetail the extreme outer corner must remain as at *G*, otherwise a small gap will appear.

CUTTING A THROUGH DOVETAIL

We will assume that two pieces of equal thickness have to be joined together. Having planed up the wood, the ends to be joined must be planed square. A cutting-gauge is set to the thickness of the wood, and both pieces are gauged all round as shown in Fig. 90. The position

of the dovetails is now marked in with pencil. The angle is important, because too small a slope gives little gripping power, whilst a large angle will probably cause the corners to break off. A slope of $\frac{5}{8}$ in. in 3 in. is correct, as shown in Fig. 91. If necessary, a template can be cut in cardboard, though after a little practice the angle can be cut easily without any guide. Fig. 92 shows the dovetails being cut.

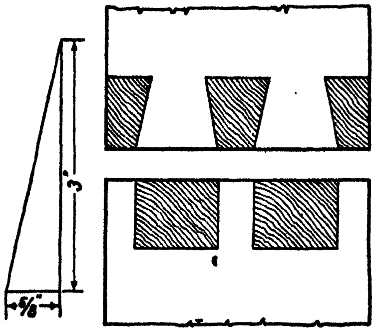


FIG. 91.—HOW DOVETAIL SLOPE IS SET OUT.

To transfer these marks, the piece having the sockets is held in the bench vice and the other laid upon it in the exact position. The saw is then placed in each kerf

FIG. 92.—CUTTING THE DOVETAILS.

Take care not to saw past the gauge lines.

FIG. 93.—MARKING OUT THE SOCKETS.
The saw is placed in each kerf in turn and is drawn backwards.

FIG. 94.—CHOPPING THE DOVETAILS.
They are cut halfway through from each side.

in turn and is drawn backwards as shown in Fig. 93. The sides of the sockets are then sawn, the cut being made slightly to the *waste* side of the marks. In this way the last named are just left in.

The chopping out of the waste pieces is shown in Fig. 94. The wood is cramped down on to a solid part of the bench, and a small sloping cut is chiselled into the gauge line. When beginning the first chop the chisel is held

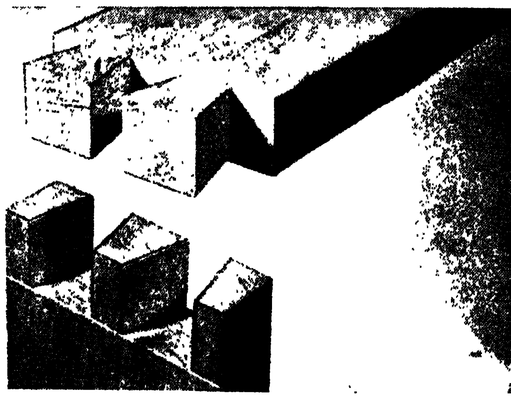


FIG. 95.—THE COMPLETED DOVETAIL JOINT.
Note that the marks on the sockets are just left in, the saw being held on the waste side of them.

about $\frac{1}{16}$ in. short of the gauge line. By making a second cut *with* the grain at the end a small piece can be taken out. A second downward cut is made, and another piece cut out from the end. The chisel can then be taken right to the gauge line. This will remove about half of the waste, after which the wood can be reversed and the remainder chopped out in a similar way. The two side pieces can be sawn off.

The completed joint is shown in Fig. 95. Dovetails should never be tried together, because this is liable to

loosen them. When all is ready they should be glued and knocked up. Do not strike the dovetail directly with the hammer. So doing will bruise the wood and may cause pieces to break off. Instead, place a piece of waste wood on top and strike this.

Dowelled Joints

Strictly speaking, the correct use of dowels is in strengthening butt joints, but they are frequently used as a substitute for the mortise and tenon. They are neither so strong nor so durable as the latter, but they have the advantage of being simpler and quicker to cut. They are used therefore by amateurs who hesitate to tackle the more difficult joint, and in cases in which economy in time is important.

Fig. 96 *A* shows the dowelled joint in the form in which it is used to replace the mortise and tenon, from which it will be seen that it can be used for a framework of practically any kind, such as a door. Two dowels at least are used, so that any tendency to twist is avoided. One point to note is that a saw-cut is made along each dowel, the purpose of which is to allow the surplus glue to escape when the dowels are knocked in. If this is not done there will either be a large space filled with glue at the bottom of the hole, or the wood will split out. The holes in both joining pieces are slightly countersunk, because glue is bound to remain in such positions and it is awkward to remove cleanly. The tops of the dowels, too, are rounded a trifle, so that they will enter their holes easily.

B shows the marking out after the wood has been prepared. The stiles (uprights) and rails (horizontals) are fixed together temporarily and the marks squared across. In the case of the rails a chisel should be used, and after separating, they should be squared round on to all four sides. The surplus is then cut off, half from each

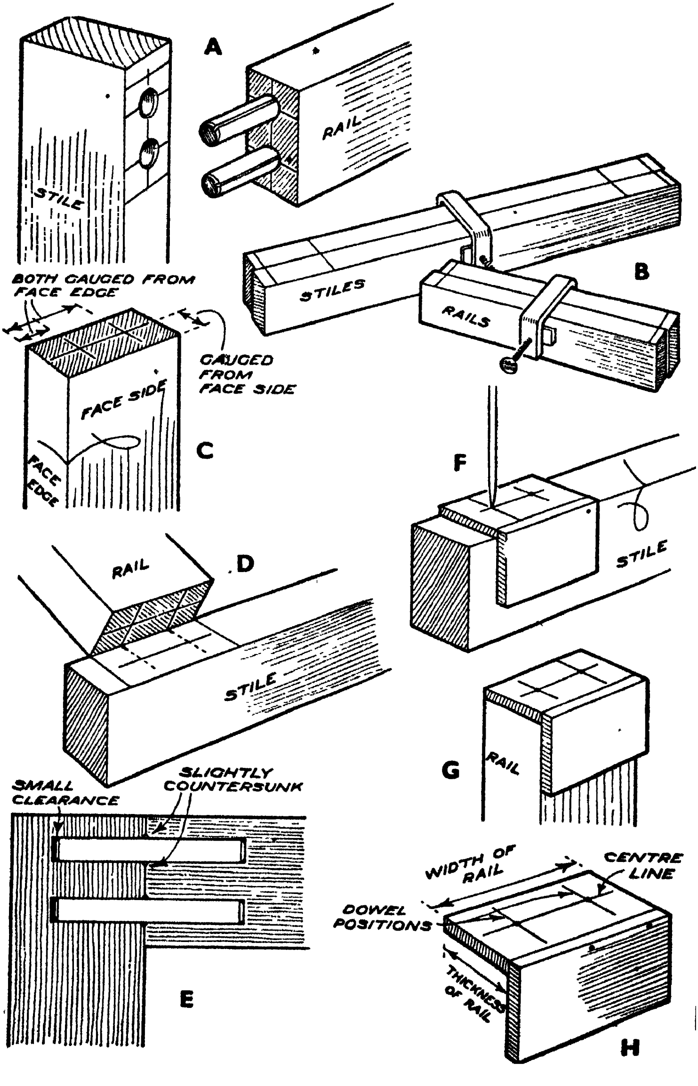

A
RAIL
STILE
B
STILES
RAILS
BOTH GAUGED FROM FACE EDGE
GAUGED FROM FACE SIDE
FACE SIDE
FACE EDGE
C
F
STILE
D
RAIL
STILE
SMALL CLEARANCE
SLIGHTLY COUNTERSUNK
E
G
RAIL
WIDTH OF RAIL
CENTRE LINE
DOWEL POSITIONS
THICKNESS OF RAIL
H

FIG. 96.

side. The positions of the dowels are marked first. Set a gauge to the centre of the thickness and mark the ends of the rails from the face side. The stiles are also marked at the joint positions. Now mark in with a pencil the distance in of the dowels, and, setting the gauge to the one, mark all the rails. The other dowels are marked in the same way, the gauge being used from the face edge in every case as at *C*.

To transfer the marks to the stiles the rails are placed in position each in turn as at *D*. Pencil marks squared across give the positions of the holes. When boring, stand at the end of the work, so that any tendency for the brace to lean to one side is at once detected. For $\frac{7}{8}$-in. wood the usual size of dowel is $\frac{3}{8}$ in. Either a piece of paper can be stuck to the bit at the required distance from the end to act as a depth-gauge, or a proper depth-gauge can be used.

Cut up the dowels into suitable lengths and make a saw-cut along each. They can then be glued and stuck into the ends of the rails and the surplus wiped away (it is here that the advantage of countersinking is realised). After the glue has set, the ends of the dowels can be rounded and the whole framework glued up.

When a fair number of dowelled joints are to be made, it is an economy to make a simple template as at *H*. The top piece is made exactly in size to the section of the wood and the dowel positions are marked upon it. A small hole is drilled at each, and to one side a piece of

FIG. 96.—METHOD OF CUTTING THE DOWELLED JOINT.

A. Completed joint.
B. Marking out.
C. How ends of rails are gauged.
D. Transferring marks to the stiles.
E. Section through joint.
F. Marking stile with template.
G. Rail being marked with template.
H. Details of template.

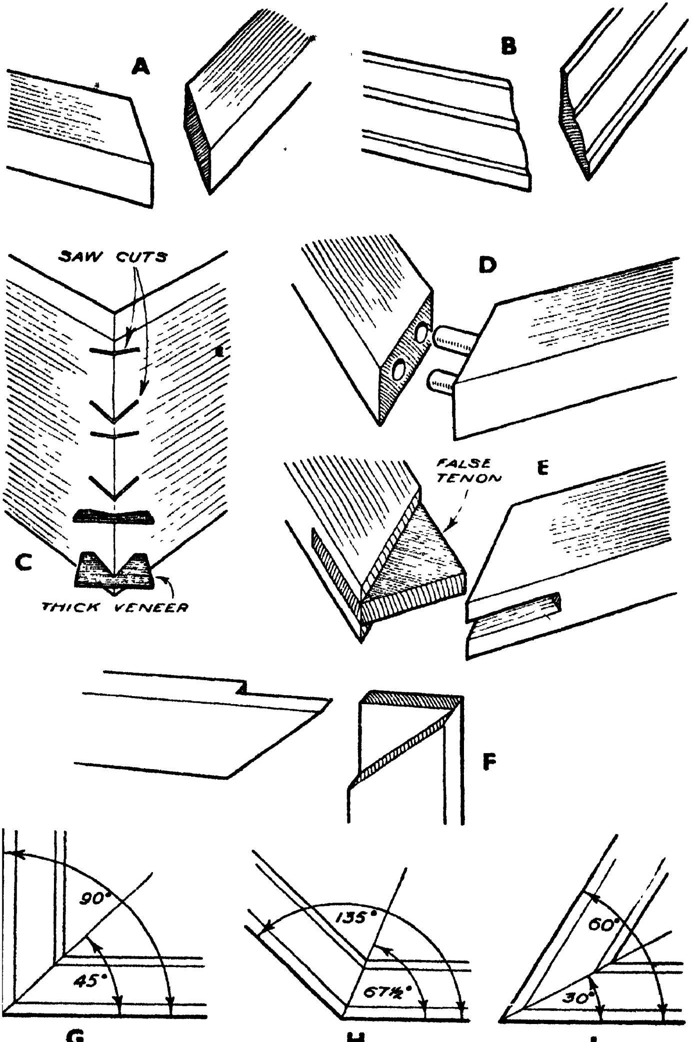

A
B
SAW CUTS
D
C
THICK VENEER
FALSE TENON
E
F
90°
45°
135°
67½°
60°
30°
G
H
I

Fig. 97.

wood to act as a fence is glued and nailed. The stiles and rails are then marked out as at *F* and *G*. After the work is done the template should be kept. Eventually it will be found that one has a collection of templates, one of which is almost sure to be correct for any work that comes along.

MITRED JOINTS

For fitting together mouldings the mitre is essential, but it is also sometimes necessary when jointing up plain wood. The golden rule to remember is that the line of the mitre always bisects (or halves) the over-all angle of the joining pieces. In most cases the last named are at right angles, and the mitreing angle of 45 degrees is fairly obvious. It is because of this that mitre blocks and similar appliances are made at 45 degrees. When the joining pieces are not at right angles, however, the 45 degrees angle is useless.

The idea is shown in Fig. 97 at *G*, *H*, and *I*. The right angle is given at *G*, which shows how the 45 degrees angle bisects it, enabling the members of the moulding to meet correctly. At *H* the over-all angle is large—135 degrees—and this means that the mitreing angle must be 67½ degrees. The same principle applies in the case of the 60 degrees angle at *I*, in which the mitreing angle is necessarily 30 degrees. Incidentally, it is a good plan to make an extra cut of 67½ degrees in the mitre block, because the

FIG. 97.—TYPES OF MITRED JOINT AND HOW ANGLE IS FOUND.

A. Simple mitre.
B. Mitre applied to moulding.
C. Strengthening mitre with veneer keys.
D. Dowelled mitre.
E. Mitre with false tenon.
F. Halved mitre.
G, H, I. How mitre line bisects over-all angle of joining pieces.

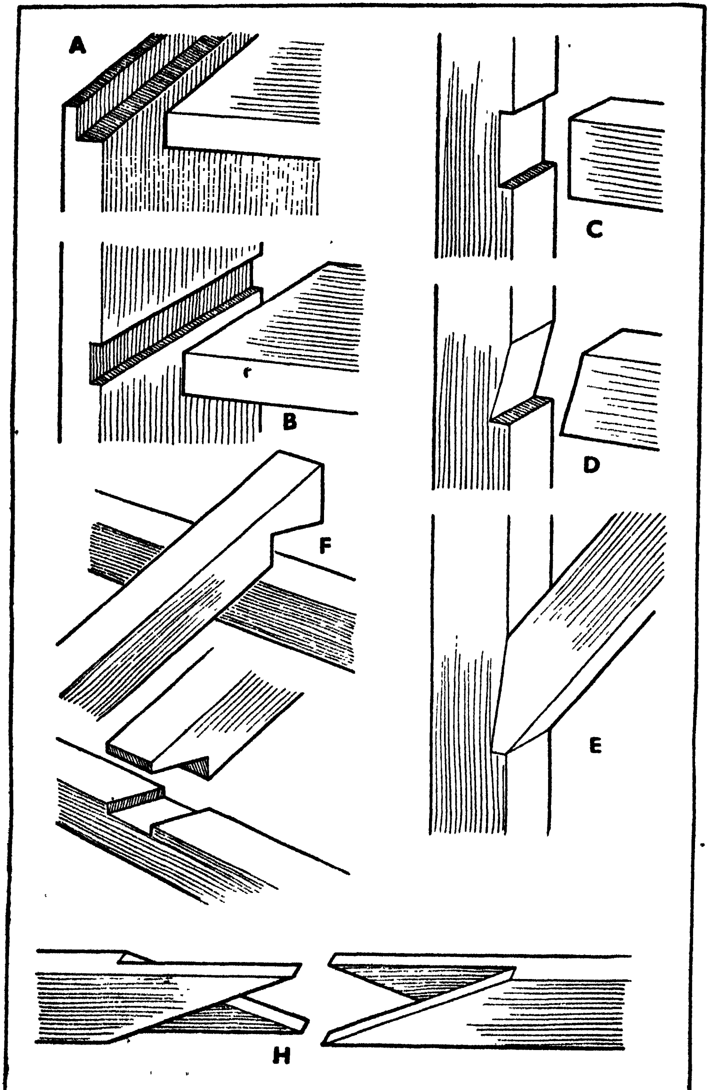


FIG. 98.

over-all angle of 135 degrees occurs fairly frequently, since this is made up of 90 degrees plus 45 degrees. It is often found in Jacobean work, in which mouldings are mitred round in various designs.

In its simplest form the surfaces of the mitre are quite plain as at *A*. It requires merely to be cut with the saw and, if necessary, trimmed on the mitre shooting-board. The same joint applied to a moulding is given at *B*. Such joints are not very strong, however, and are suitable only when the parts are being fixed to a framework or some similar support. When they have no such support, additional strength is needed. *C* shows one way of providing this. It represents the corner of a box with mitred corners. The joint is cut with plain surfaces (as that at *A*) and is glued up. When the glue has set, a series of saw-cuts is made dovetail fashion across the corner and pieces of stout veneer are glued in them. The projecting pieces are levelled down after the glue has set.

At *D* the joint is strengthened with dowels. The positions of these are marked out with the gauge, and the holes bored at right angles with the mitre. A somewhat similar but stronger joint is that at *E*, in which slots are cut and a loose or false tenon is glued in. This has the disadvantage of showing at the edge. If desired, the tenon could be cut in the solid in one of the pieces. When the mitre need show at the front only, the halved mitre at *F* could be cut. The cutting of this is the same as that described for the halved joint.

FIG. 98.—VARIOUS TYPES OF JOINTS.

A. Lapped joint.
B. Housed joint.
C. Simple notch.
D. Bevelled notch.
E. Bevelled notch for sloping rail.
F. Bird's-mouth joint (top).
G. Bird's-mouth joint (bottom).
H. Spliced joint.

VARIOUS JOINTS

A simple form of joint useful when making boxes, small carcases, and so on is the lapped joint shown in *A*, Fig. 98. The one piece has a rebate cut in it, and the other is fixed with glue and nails. The rebate is gauged in, and a saw-cut made across the grain. The waste is then chopped out with a chisel and if necessary finished with the rebate plane. Of a similar type is the housed joint at *B*, but its use is to support a shelf. The sides of the groove are sawn across and the waste is chiselled away. A router is handy to make the depth equal throughout.

In rough outdoor carpentry the three types of notched joints at *C*, *D*, and *E* are useful. They are used in main structural frames. The parts are skew-nailed together, and, fixed in this way, they are much stronger than a plain nailed joint. Those at *F* and *G* come in useful in roof work to fix the rafters to the ridge and to the sides. That at *F*, of course, is at the top, and is notched over the ridge, whilst that at *G* would be cut at the bottom of the same rafter to fix to the side framing.

The spliced joint at *H* is used to joint together two pieces in their length, and is much stronger than the simple splice, where the two ends are merely tapered.

CHAPTER III

WORKSHOP PRACTICE

How to Make a Door

Until the last few years practically the only form of door was the framed-up type with separate panel fitting in a groove or rebate. The underlying principle of this was that the framework provided the strength, whilst the panel, fitting loosely within it, was free to shrink, this preventing the possibility of splitting. It is still used to some extent, but the present-day manufacture of reliable plywood and laminated board has made the flush door without any framing a practical and reliable form of door.

FLUSH DOORS

In its simplest form the flush door is simply a piece of plywood or laminated board fitted to the cabinet; but this has the disadvantage of showing unsightly layers at the edges, and various means of concealing these have to be adopted. An edging or lipping about $\frac{1}{8}$ in. thick is applied all round, this being either planed flush, bevelled, or made to project in the form of a bead as in Fig. 99. Actually, the most satisfactory edging is tongued on as at *D*, though this necessarily entails a groove being worked all round. In any case allowance has to be made for the edging. One point to note is that plywood is suitable only when the hinges are fixed at the surface. If they are to be at the edge, there are complications, because the screws will not grip well in the layers.

The best form of flush door is that in Fig. 100, in which the edging is mitred round and both sides are veneered.

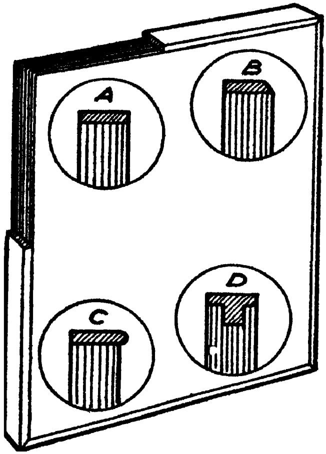


FIG. 99

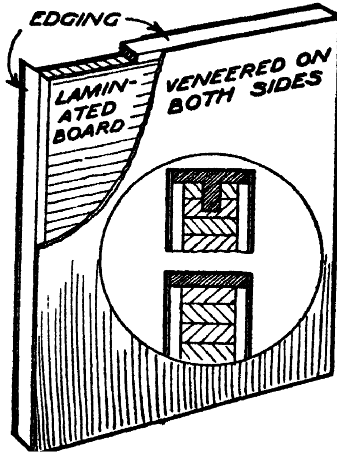


FIG. 100

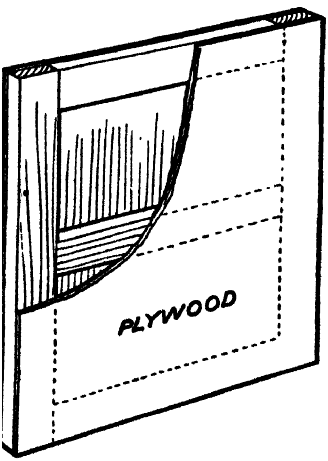


FIG. 101*

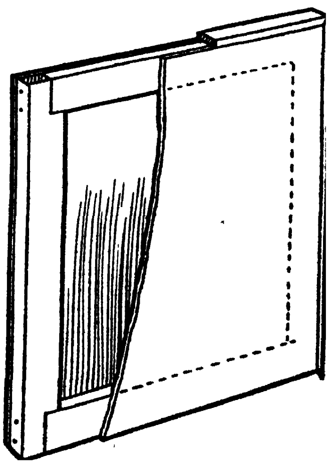


FIG. 102

FIGS. 99–102.

The veneer thus conceals the edgings. This method is possible only when the door can be veneered *after* the edgings are fixed. If a ready-veneered piece of plywood is used, one of the methods in Fig. 99 must be followed. Note that the grain of the veneer runs at right angles with that of the outer layers of the laminated board.

Both the foregoing methods require the use of stout ply or laminated board, and a useful alternative is to make a thin inner framework and to fix to each side a sheet of $\frac{1}{8}$-in. or $\frac{3}{16}$-in. plywood as shown in Fig. 101. For a door of, say, 18 in. in length the inner framework could be of $\frac{1}{2}$-in. stuff and the plywood $\frac{3}{16}$ in., giving a total thickness of $\frac{7}{8}$ in. For small doors the centre rail is unnecessary, but it is advisable for large ones, to prevent any tendency for the ply to sag. The joints of the framework should preferably be the mortise and tenon, though a halved joint could be used. If desired, the edges could be lipped as in previous examples.

For a very simple door the construction at Fig. 102 could be followed. It is somewhat rough and ready, but is handy for quick jobs. The uprights are notched and nailed to the rails.

In all these doors the plywood should be glued to the framework; and if this is properly done no other fixing will be necessary. Some may prefer to drive in fine nails and punch in the heads.

For very small flush doors, solid wood could be used, but it is not recommended for large ones, because of the liability to shrink and possibly warp.

Figs. 99–102.—Various Types of Flush Doors.

Fig. 99.—Door of Thick Plywood with Lipping.
Fig. 100.—Edged and Veneered Laminated Board.
Fig. 101.—Framework with Glued-on Ply Panels.
Fig. 102.—Simple Notched Framework with Ply Panels.

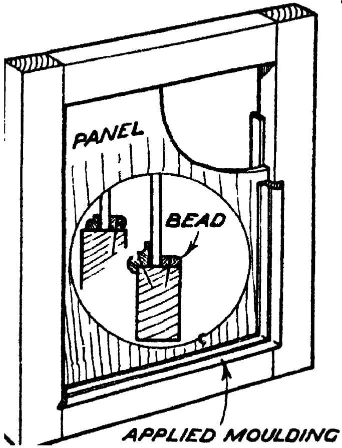


FIG. 103

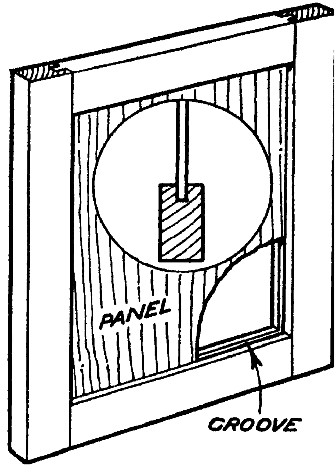


FIG. 104

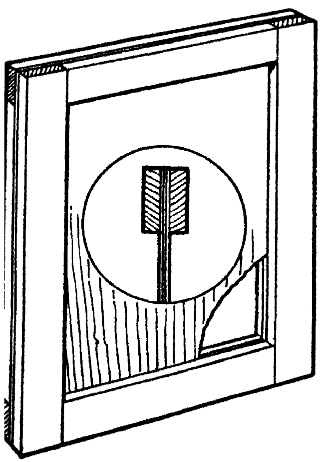


FIG. 105

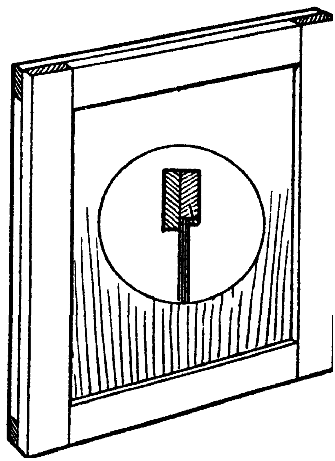


FIG. 106

Figs. 103–106.

PANELLED DOORS

There are many varieties of these, the commonest of which is that with the panel fitting in a rebate as shown in Fig. 103. Its advantage is that the rebate is formed by an applied moulding (two types are given), which means that no rebate has to be worked. The simple mortise and tenon (see Fig. 87, Chapter II) or dowelled (see Fig. 96, Chapter II) joint can be used at the corners. The panel is held by a bead at the back. Sometimes it is required to fit the panel in grooves, and this necessitates grooving the rails as in Fig. 104. As, however, ready-grooved rails can be obtained, this does not present any special difficulty.

When it is desired to eliminate joints altogether, the simple method given in Fig. 105 can be followed. It does not make a very strong door, but it will do for work not requiring a high standard of finish. A piece of $\frac{3}{16}$-in. plywood is cut to the over-all size, and $\frac{3}{8}$-in. or $\frac{1}{4}$-in. strips are glued and nailed around the edges, the joints being merely butted. Note that the front joint is upright and the back one horizontal. Another variation of the same thing is that in Fig. 106, in which strips of $\frac{1}{2}$-in. stuff are glued together. Those at the back are $\frac{1}{4}$ in. narrower than those at the front, so that a rebate is thus formed in which the panel can fit.

MAKING THE DOOR

As an example of the procedure, let us suppose that a door has to be made to fit a cupboard, the inside size of which is 18 in. by 12 in. as in Fig. 107. To allow for trim-

FIGS. 103–106.—FRAMED-UP DOORS IN VARIOUS FORMS.

FIG. 103.—DOOR WITH APPLIED MOULDING AND BEAD.
FIG. 104.—PANEL GROOVED IN.
FIG. 105.—SIMPLE DOOR WITH "FRAMEWORK" GLUED ON.
FIG. 106.—SIMPLE WAY OF MAKING DOOR WITH REBATE.

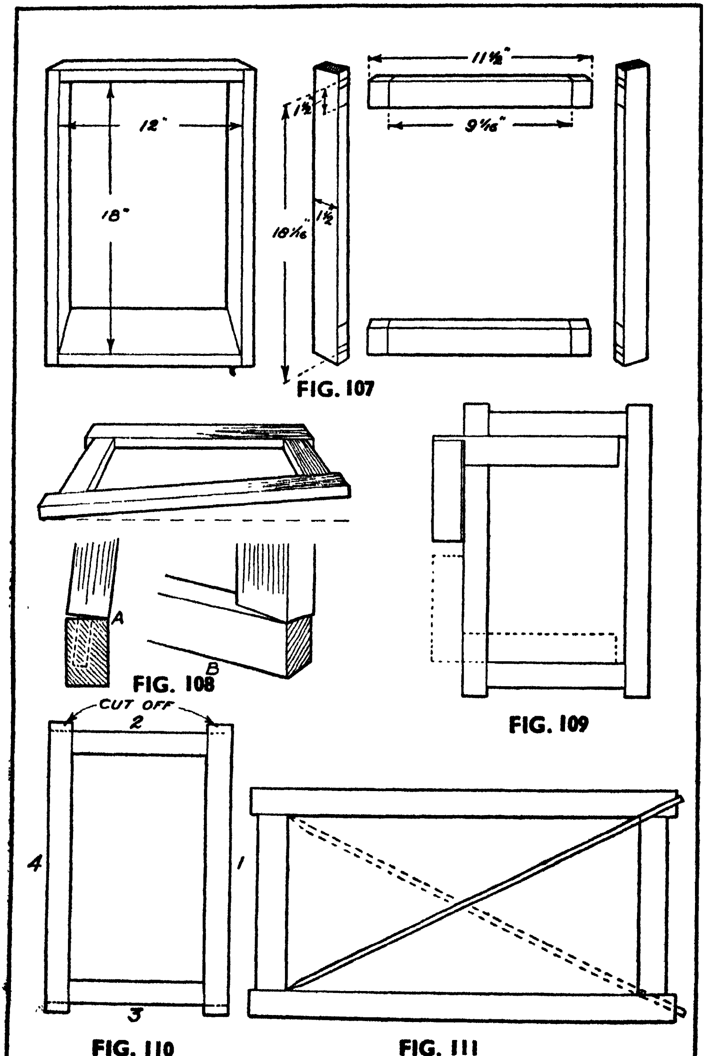


FIG. 107
FIG. 108
FIG. 109
FIG. 110
FIG. 111

FIGS. 107–111.

ming, the door should be about $\frac{1}{16}$ in. full in length and width, which means that the stiles will be marked to $18\frac{1}{16}$ in. The way in which the parts are fixed together whilst marking out has already been dealt with in Fig. 88, Chapter II.

The joints having been cut, each should be fitted individually and marked so that that they can be replaced in the same positions. The whole thing is then tried together to see that it is free from winding. This is done by holding the framework in line with the eye, when the near and far rails should appear parallel. Fig. 108 shows a door in winding. The trouble is due to faults in the joints, and may be caused by either the mortise or tenon being cut at an angle (*A*), or by one or the other not being parallel with the side (*B*). The remedy is obvious. Note, however, that in correcting these faults the joint is almost sure to make a loose fit, so that bad cutting should be avoided. A tenon should make a comfortable hand-tight fit.

It can now be glued up. Both mortise and tenon are glued, and the whole is cramped up. A small door such as that with which we are dealing can be tested for squareness with an ordinary try-square as in Fig. 109. In a larger one it is better to use the diagonal strip method, in which a lath of wood is pointed at one end and placed diagonally across the door and the length marked. When reversed into the opposite corners, it should show the same length as in Fig. 111.

When the glue has set, the projecting ends of the stiles are sawn off as in Fig. 110. The hingeing edge (right hand)

FIGS. 107–111—STAGES IN MAKING A FRAMED-UP DOOR.

FIG. 107.—HOW SIZES ARE CALCULATED.
FIG. 108.—DOOR IN WINDING WITH (*A* AND *B*) LIKELY CAUSES.
FIG. 109.—TESTING DOOR WITH SQUARE.
FIG. 110.—ORDER IN WHICH EDGES ARE PLANED.
FIG. 111.—TESTING DOOR WITH DIAGONAL STRIP.

is planed true, and the top edge trimmed so that it fits accurately against the cupboard. The bottom edge follows, and finally the opening edge (left hand) is fitted. The notes on hingeing given on page 119, Chapter III, should be read, because it will be seen that this opening edge has to be planed at a slight angle. There should not be any gaps around any of the edges, but the door must not bind anywhere. Remember that if the job is to be polished later, the polish will build up a certain thickness. When cleaning up the surfaces take the plane along the rails, and so across the stiles at the joints. Be careful not to splinter out the edges. Holding the plane at an angle does a great deal to avoid this. Afterwards run the plane along the stiles so that any roughness previously caused by planing across the grain is taken out. Finish with the scraper and glasspaper, using the latter in the same way as the plane.

The panel should never be glued in, as this may cause splitting. Incidentally it is always better to leave fixing this until after polishing because it is awkward to work the polishing rubber into the corners. In the case of a grooved-in panel it cannot be avoided, but even here the edges should be stained before assembling, so that in the event of shrinking there will not be any edges of white, unstained wood showing.

LEDGED AND BRACED DOOR

This sort of door is suitable for any outdoor structure of the rougher kind, such as for a poultry shed, workshop, and so on. It consists of a series of tongued and grooved boards placed side by side and held together by horizontal pieces known as ledges. Sometimes doors are made with these parts without other further additions, but it is strongly advisable to add braces as shown in Fig. 112,

because otherwise the door is liable to sag badly. Braces effectually prevent this.

It is seldom possible to arrange an exact number of tongued boards to suit the width. It is usually necessary to have two boards narrower than the rest, and the general plan is to arrange these at the outside. Avoid very narrow boards outside, however, because these may be liable to peel away.

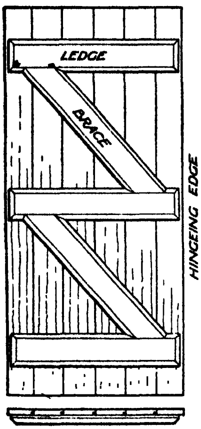


FIG. 112.
LEDGED AND BRACED DOOR.

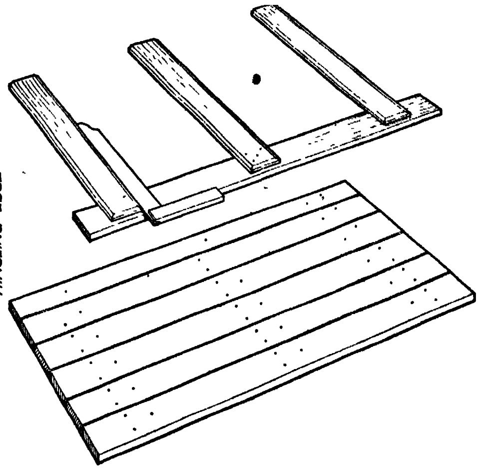


FIG. 113.
FIRST STAGE ON ASSEMBLING THE DOOR.

Cut off the required number of boards, allowing them full in length for cutting off to final size and trimming later. Remember that the two outer boards must have in the one case the tongue cut away and the groove in the other. It is important that these outer edges are planed straight and square. A usual thickness for these boards is $\frac{7}{8}$ or $\frac{3}{4}$ in., according to the size and importance of the door. The ledges and braces should be preferably of

1¼-in. stuff, though in quite light doors they are sometimes reduced to ⅞ in. Cut off the three ledges to length, allowing them to stand in about ½ in. at each end. Plane the edges to chamfer as shown.

Begin assembling as in Fig. 113. Take one of the outer tongued and grooved boards and to it nail the three

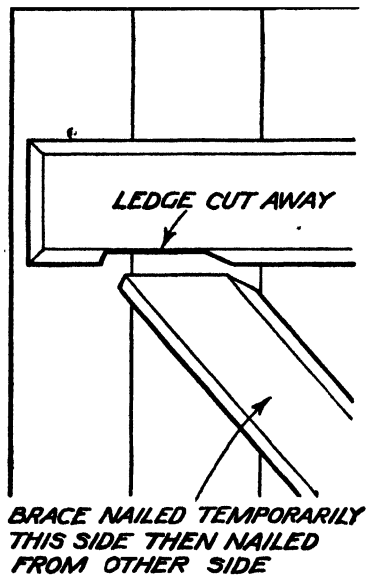


FIG. 114.—HOW BRACES ARE FITTED WITH THE LEDGES.

ledges as shown, taking care to keep them at right angles. A large wooden square could be used for testing. Now turn the whole thing upside down and place the remaining tongued and grooved boards in position. Keep them square at the end and nail down. Assuming that three nails are being driven through a board into each ledge, two lines should be squared across the boards as an indication where the nails are to go. It will be realised that it is

always advisable to nail through the thinner wood into the thicker. Do not cramp the boards together too tightly, because in the event of their swelling owing to exposure to the atmosphere they may buckle.

Fig. 114 shows how the ledges are cut away to receive the braces. Note that the notches are cut in level with the chamfer. The simplest plan is to place the wood for the brace in position and mark the ends with a pencil. A square piece of this wood placed on the boards will enable the length to be squared up across the chamfer.

You cannot use a saw very well for cutting the notches in the ledges. A chisel must be used instead. Cut in slightly short of the ends first, and then chisel down vertically. Finally make a chisel cut right up at the ends. Nail the brace temporarily in position, then turn the whole upside down and nail through from the face. The strongest door is obtained by allowing the nails to pass right through and be clenched at the back. Note that it is essential that the braces are arranged so that their lower ends are at the hingeing side. If the hinges are arranged on the boarded side, place them level with the ledges, so that long screws can be used. Long strap hinges are the type to use.

FRAMED AND BOARDED DOOR

Doors of this kind are used for outdoor buildings, sheds, etc., for which a rather better type of door is required than the plain ledged and braced type. Inside it has the quite nice appearance shown in Fig. 115, especially if the stiles and rails are chamfered as suggested. Outside the tongued and grooved boards are contained between the stiles.

Note that thick wood ($1\frac{3}{4}$ in. or 2 in.) is used for the main stiles and top rail only. The remaining three rails are

less the thickness of the tongued and grooved boards. The reason for this is that the last-named fit in rebates

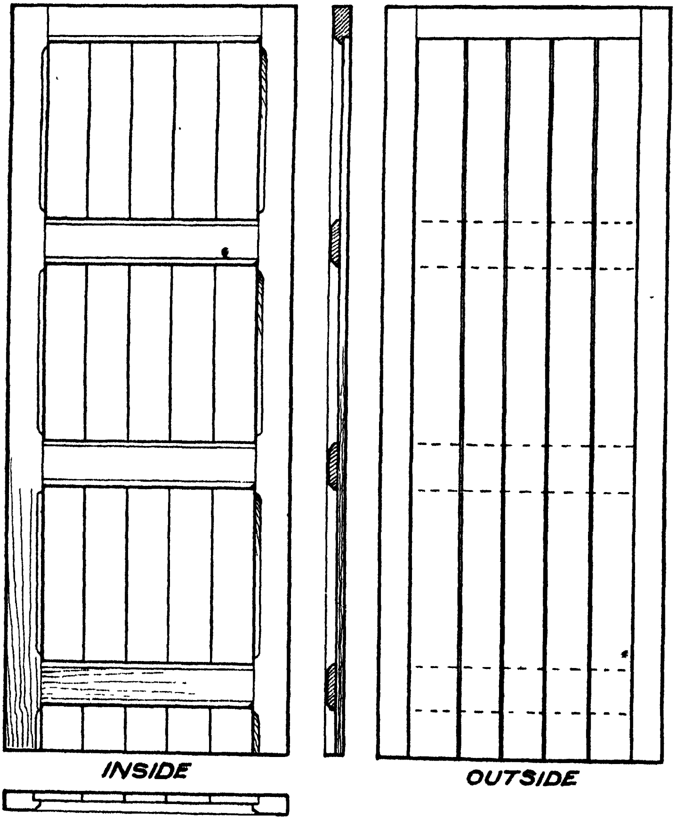


FIG. 115.—FRAMED AND BOARDED DOOR.

worked around the stiles and top rail; the remaining rails are flush with the rebate.

Decide the thickness of the materials beforehand. Thus, assuming that you use 1⅞-in. stuff for the thick

members, you can have ¾-in. tongued and grooved boards with 1-in. rails, or you can have both in ⅞-in. Mark out the two stiles. For the top rail the mortise is central, but in the case of the three lower rails it is set in level with the rebate. This enables a bare-faced tenon to be used for the rails as in Fig. 116. Gauge in the width and depth of the rebate and chop the mortises. These run right through, and at the outer edges an extra allowance of about ⅛ in. should be made so that the tenon can splay out when wedges are driven in.

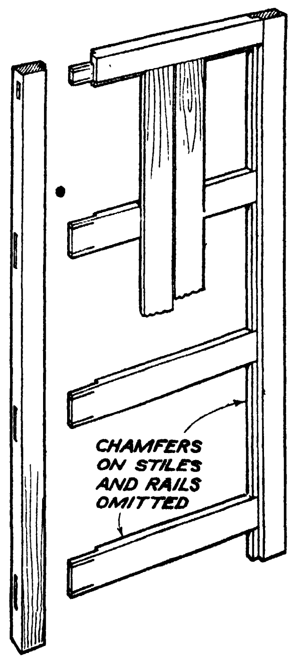


FIG. 116.—GENERAL VIEW SHOWING CONSTRUCTION.

When marking the rail top length, note that long and short shoulders are necessary. This is made clear in Fig. 117, which shows how the one shoulder has to reach down into the rebate. The shoulder length of the three lower rails agree with the short shoulders. Having cut the tenons, proceed to rebate the stiles and top rail. The chamfer can also be worked. Those on the rails can run right through in every case. On the stiles, however, they must be stopped short of the joints. This is seen in Fig. 114.

When all is ready, glue up the main framework, wedging the tenons from outside. Clean off any surplus glue, and when the latter has hardened level the joints. The tongued and grooved boards are nailed in position. It is advisable to arrange them so that in the event of there

being an odd space to fill, a narrow piece is fitted at each side, though this narrow piece should not be less than about 2 in. In any case, they require to have their tongues and grooves planed away at the outer edges. Fig. 116 shows how the parts fit.

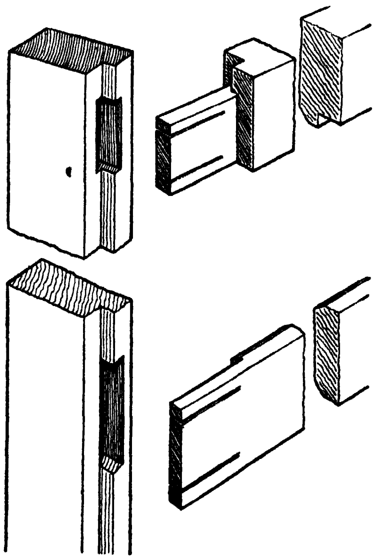


FIG. 117.—TOP RAIL JOINT, AND BARE-FACED TENON USED FOR THE LOWER RAILS.

MAKING A WINDOW-FRAME

This type of window-frame is suitable for practically any outdoor structure, such as a shed, garage, and so on. The joints differ from those normally used in indoor woodwork, such as furniture. Strength is of greater importance.

WINDOW-FRAME

It is not always necessary to fit a separate window-frame when there are suitable rails in the main structure,

but sometimes it is needed for one reason or another, and the construction shown in Fig. 118 can then be followed. The uprights are plain pieces, square at both top and bottom. At the top they fit into a simple rebated joint

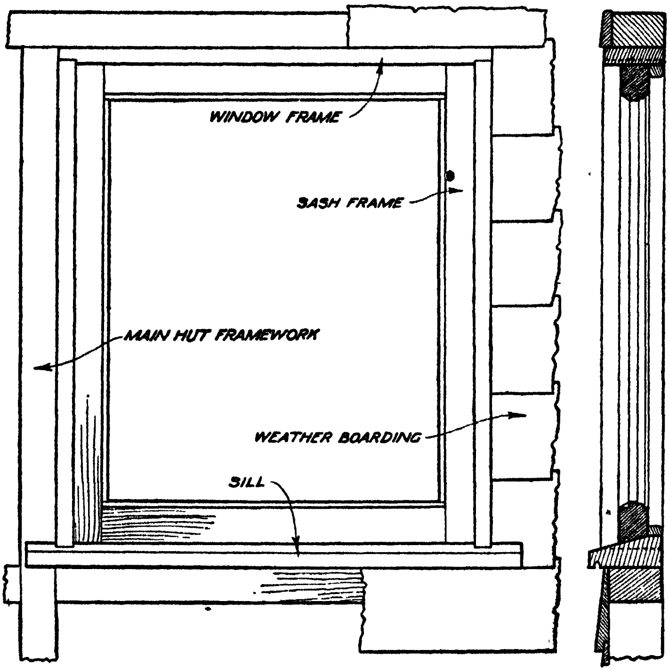
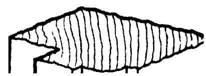


Fig. 118.—Window and Sash Frames for a Shed.

cut in the top. At the bottom the sill has a grooved joint into which the uprights fit. This is shown in Fig. 119. Note how the sill is cut away so that it projects at each side of the uprights. Apart from strength, the great advantage of these notched joints is that they give an exact position when assembling. As usual in all such outdoor work, assemble the joints with paint and dovetail

the nails. Note from Fig. 118 the weather groove beneath the sill. When ready, fit in position in the hut structure and fix with nails. Beads will be added round the inside to form a rebate, but these are best left until after the window has been made and fitted. The beads can then be fixed to line up exactly with the window-frame.



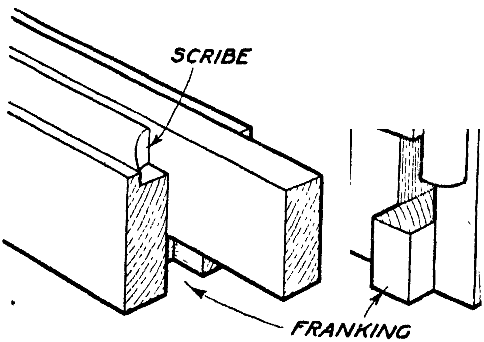


Fig. 119.—Joint used for the Sash Frame.

A SASH FRAME

The joint required for this is shown in Fig. 120. The material can normally be obtained ready machined with the rebate and moulding. Note how the tenon occupies the full width of the square member. Chop in the mortise, allowing for the franking at the end, and cut away the moulding locally opposite the franking and part of the mortise. The exact amount allowed to project does not matter, providing it is slightly more than the moulding width.

The tenons have equal shoulders, and at the edge a notch is cut so that it fits over the franking. The moulding is scribed so that it fits exactly over the moulding of

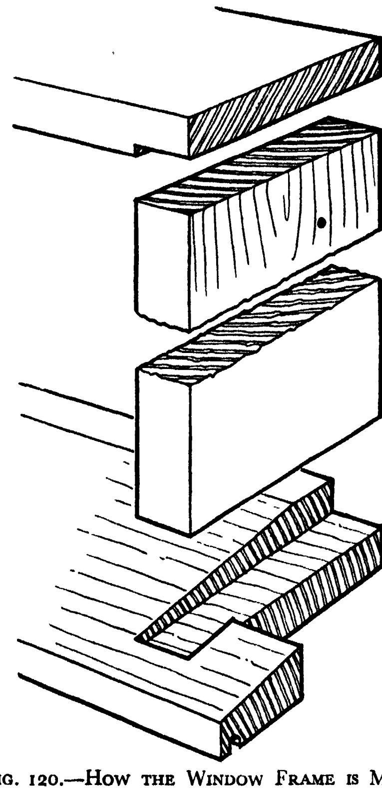


FIG. 120.—HOW THE WINDOW FRAME IS MADE.

the mortise piece. The simplest way of cutting this scribe is to mitre the end of the moulding first. This gives the exact line down to which the scribe has to be cut. The advantage of the scribe is that it is not liable to open in the event of shrinkage.

Make two saw cuts about $\frac{3}{16}$ in. in from the edges of the tenon so that the latter can be wedged after assembling. It will have been realised, of course, that the mortise must be cut fuller at the outside than inside to allow the tenon to expand when wedged. Assemble with paint and, when set, level the joints and fit to the opening, planing the bottom edge at an angle to coincide with the slope of the sill. A full allowance should be made all round for the paint, which forms considerable thickness after two or three coats.

The glass is puttied in, and note that, first, a coat of flat paint must be applied to the rebate, as otherwise the putty will not adhere. Give a good bed of putty all round the rebate, press in the glass (which should have a generous allowance all round), and line up the putty at the outer corner, drawing along the knife to make perfectly smooth.

Making a Drawer

To make a really good job of a drawer the parts should be dovetailed together. No better method of construction has ever been invented. At the same time, there are jobs on which the reader may not feel justified in spending much time, and we therefore give, in addition, a simple method which will prove satisfactory for a piece of work that is not important. First the dovetailed method.

A Dovetailed Drawer

For the usual run of drawers used in such pieces as tables, chests of drawers of moderate size, and so on, a thickness of $\frac{7}{8}$ in. or $\frac{3}{4}$ in. is suitable for the front. The sides and back can be $\frac{3}{8}$ in., and the bottom $\frac{3}{16}$ in. The latter is nowadays usually of plywood, and is held by a grooved moulding made specially for the purpose.

Begin with the front. Plane the lower edge true, and trim one end so that it makes a perfect fit with the side of the cabinet. If it is placed in position as at *A*, Fig. 121, it is easy to test. Mark the exact length and width, and

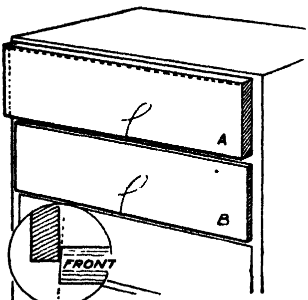


FIG. 121

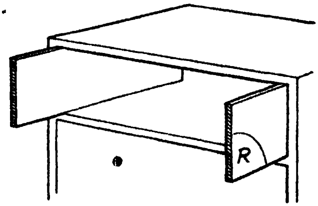


FIG. 122

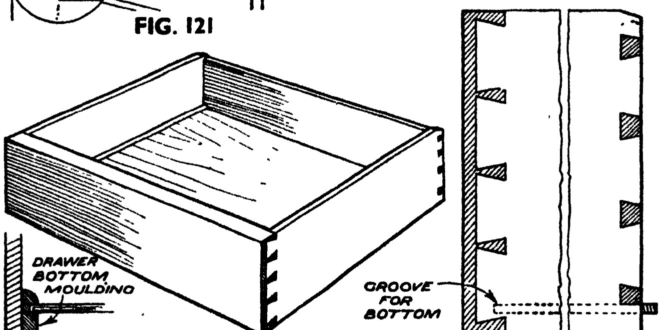


FIG. 123

How Dovetailed Drawer is Made.

Fig. 121.—Fitting the Front.
Fig. 122.—Sides being Fitted.
Fig. 123.—Completed Drawer and Setting out of Dovetails.

trim first the end and then the top until it makes a close fit. It is a good plan to make a *slightly* tapering fit, so that the inner face can just be entered into the opening. The taper must, however, be very small: not more than

the thickness of a shaving. *B* in Fig. 121 shows the front at this stage. The inset shows in exaggeration the taper.

The sides follow, and, the bottom edges being planed straight, the ends are made square, both of exactly the same length. A gauge is set to slightly more than the width, and the top edges are planed until each side makes a hand-tight fit as shown in Fig. 122. The front edges should be marked *R* and *L*, so that there is no confusion when assembling. The back is treated similarly to the front, except that the edges are square and it is narrower than the front. The reason for this is seen in Fig. 123, which shows how the back stands *above* the bottom and is set down slightly at the top. It is necessary, therefore, to obtain the drawer bottom moulding beforehand, so that the distance of the bottom from the bottom edge is known.

It is usual for the bottom to rest in a groove in the drawer front, and it is necessary, therefore, for the bottom dovetail at the front to be low, so that the groove occurs *within* the dovetail; otherwise a gap will show at the ends. Notice that lapped dovetails are used, and that the pins run almost to a point. At the back the lowest cut does not slope, because the bottom edge of the back runs through here.

The cutting of the dovetails is the same as already explained (see photographs in Chapter II, page 83). Before assembling, the groove for the bottom in the drawer front is worked, and the top edge of the back is rounded over. When glueing up, place a piece of wood over the joints and strike this so that the wood is not bruised, and to avoid splitting the corners. Test for squareness with the try-square and put aside.

When the glue has set, clean up the joints and fit the drawer. Make sure where the drawer sticks before taking off any shavings. The moulding is now glued in, and

finally the bottom passed in from the back and screwed to the back. If solid wood is used, the bottom should be allowed to project about ¼ in. at the back, so that in the event of shrinkage it can later be pushed forward. This is unnecessary in the case of plywood. A good lubricant for drawers is candle-grease, but this should not be applied until after the work has been polished.

A SIMPLE METHOD

In place of dovetails a simple lapped joint can be used at the front as in Fig. 124. The back fits in grooves. The

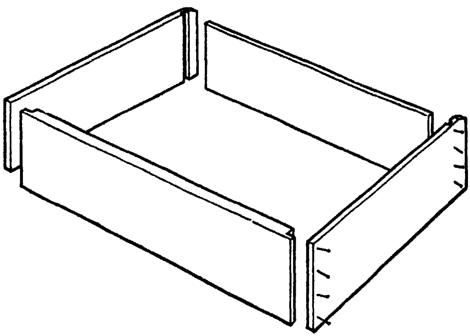


FIG. 124.—SIMPLE DRAWER CONSTRUCTION.
The front corners are lapped and the back ones grooved.

preliminary fitting is the same as that already described, except that the back is cut short by an amount equal to the thickness of wood left at the bottom of the two grooves. Fig. 125 shows how the wood is marked out with the gauge. The rebates in the front are cut by first sawing across the grain and then chopping away the waste with the chisel. The sides of the grooves can be sawn in and the waste partly chiselled away and finished off with a router. To avoid grooving the front, the drawer bottom moulding can be fixed here as well as at the sides. The

whole thing is put together with glue and nails, the last named being driven in dovetail fashion and punched in.

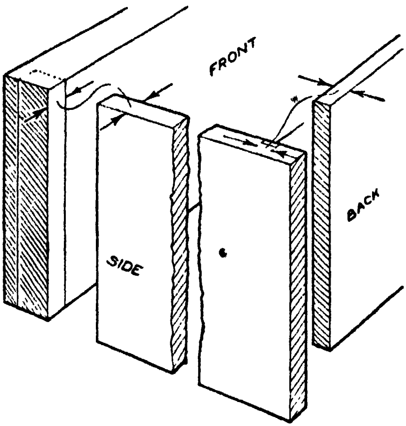


FIG. 125.—DRAWER CONSTRUCTION.
How parts are gauged when making simple drawer.

FIG. 126.—DRAWER SUSPENDED BENEATH TOP.

Sometimes a drawer has to be suspended beneath a top as in Fig. 126, there being no sides immediately adjacent. To support it strips of wood are screwed to the top edges of the sides. These run in pieces fixed beneath the top as shown. A block of wood fixed beneath the top near the front edge serves as a stop both in preventing the drawer from being pushed too far in and from being pulled right out.

HOW TO FIT A LOCK

To make a broad distinction, there are two kinds of locks used in furniture: those requiring merely to be screwed on, and those which have to be let in. The latter kind are by far the better, because they are much neater, and they take up no space in the drawer, or whatever it may be. Some locks are made so that they can be used on either a drawer or a door, the hole for the key being cut in duplicate. Others are made specifically for the one or the other, and must be ordered accordingly.

One other point is that a door may close on either right or left hand, and care must be taken to select the correct one. An example of a "left-hand" lock is given at *A*, Fig. 127. This could be used for a drawer.

Another type of lock used for boxes is the link-plate, in which a separate plate is fixed to the lid. Projections in this pass into the body of the lock, and the bolt passes through holes in them. A variation of this is the lock used on a door which closes over the face of the carcase.

A DRAWER LOCK

We may take as an example the fitting of a simple drawer lock. To give a neat finish, a brass flush escutcheon should be provided, a size being selected to suit the key. An example is given at *A*, Fig. 127. First square down a line in the centre of the front from the top edge, and set a gauge to the centre of the pin of the lock from its top edge as at *B*. With it mark the front at the line. This gives the position of the pin. Select a bit which will make a hole slightly less in diameter than the top rounded part of the escutcheon, and bore right through the front as at *C*. Place the escutcheon in position and tap it lightly with the hammer, so that it makes an indentation (*D*). Then, fixing the drawer on the bench, cut down the sides with the keyhole saw (*E*), and chisel away the waste. The escutcheon can be tapped in flush.

The next step is to mark where the wood has to be cut away to enable the body of the lock to be let in. This is done by holding the lock with the pin opposite the centre line (this is squared across the top edge) and marking the sides as at *F*. These lines are squared down inside, and a gauge is used to mark both the thickness and the depth.

When cutting away the waste, make a saw-cut at each line as at *G*, and a series of cuts between to cut up the grain. Cut down the sides with the chisel and pare away

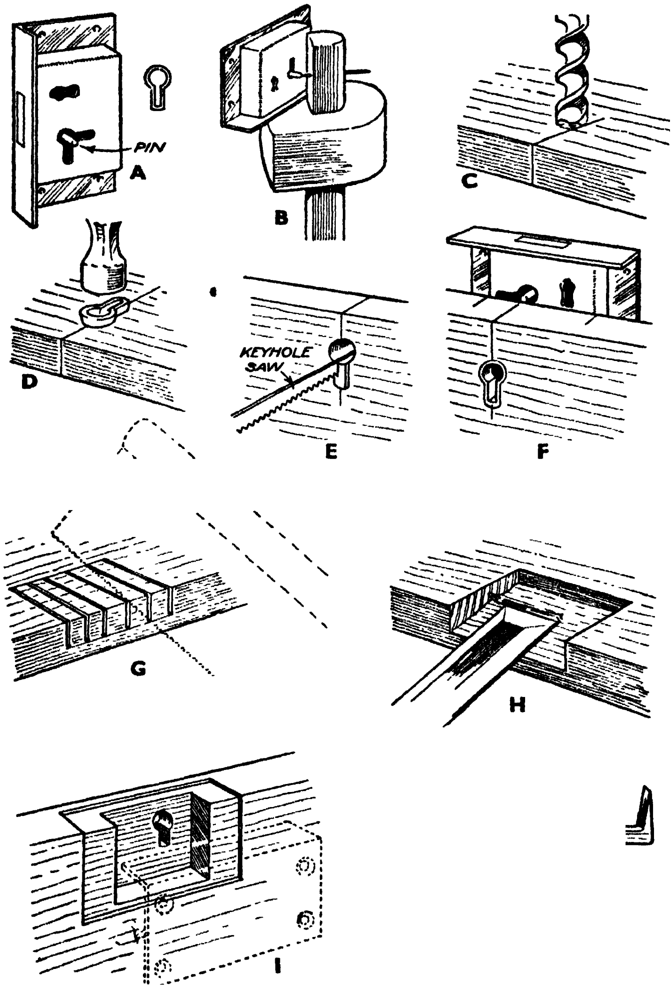


FIG. 127.

the waste as at *H*. This will enable the lock to be placed in position so that the outer plate can be marked round. Sometimes only the top part of the plate is let in flush, and this certainly saves time, though a much neater job results when the back is let in also. The sides are cut round with the chisel and the waste is carefully pared away.

When the screws have been driven in, the position of the mortise to allow the bolt to be shot home can be marked. This is done by smearing a little dark paste (such as the dirty oil from an oilstone) on the top of the bolt. The key is then turned and the drawer pushed right home. If the key is turned, the bolt will leave an impression on the upper rail of the chest. A drawer lock chisel is handy with which to cut the mortise. It is shown at *J*. Otherwise a short chisel or even a bradawl can be used.

When a box lock is fitted, the general procedure for fixing the lock is similar. To enable the link-plate to be fixed, it is placed in position on the lock. It will be found to have a couple of spikes at the top side, and by closing the lid and thumping it, the spikes will enter the lid and will rise with it when the latter is opened.

How to Fit Hinges

There are a great many varieties of hinges, each designed for a special purpose, but those most commonly

Fig. 127.—Stages in Fitting a Lock.

A. Lock suitable for door or drawer. Note also escutcheon.
B. Setting gauge to pin.
C. Boring for escutcheon.
D. Tapping escutcheon to make indentation.
E. Sawing sides of keyhole.
F. Marking position of body of lock.
G. Preliminary sawing out.
H. Paring away waste.
I. Notch for lock completed.
J. Drawer lock chisel.

used are shown in Fig. 128. The simplest kind is that intended to be screwed straight on to the door without being recessed, and these usually have a decorative shape to take off their crudeness. An example is that at *A*, a type suitable for oak furniture. They are not, however, specially strong, because the whole weight of the door falls on the screws, and a much neater type is the butt hinge

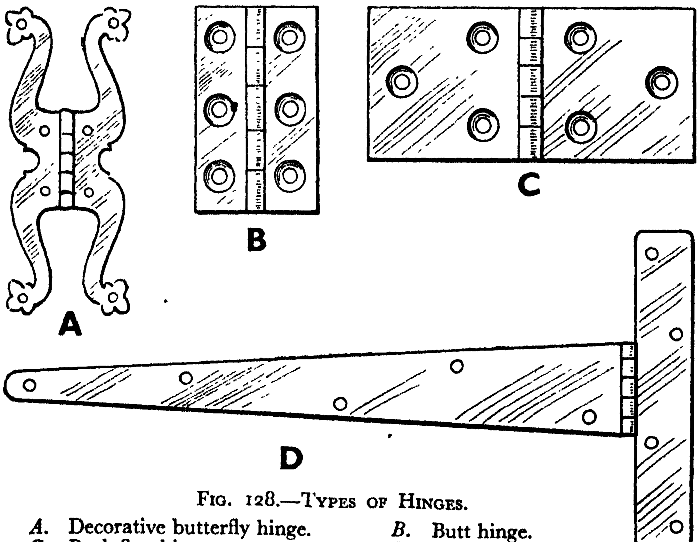


FIG. 128.—TYPES OF HINGES.

A. Decorative butterfly hinge. *B*. Butt hinge.
C. Back flap hinge. *D*. T hinge.

shown at *B*. This is intended to be recessed into the wood, so that the hinge, in resting in its recess, is supported to a large extent quite apart from the screws. These can be obtained in sizes from $\frac{3}{8}$ in. up to 3 or 4 in., and in both brass and iron. The former are the more suitable for cabinet work.

Similar in type is the back flap shown at *C*. The leaves are, however, much wider, being practically square, and they are used for such jobs as bureau falls. The

other type, *D*, known as the T hinge, is used for outdoor work for hanging large doors, and is similar to the kind at *A*, in that it does not require to be let in. When both these kinds are fitted, all one needs to watch is that the knuckle lies exactly over the crack between the door and the cupboard, or whatever it may be.

THE BUTT HINGE

The position in which a hinge is fixed depends upon the way the door is to be hung. For instance, at *A*,

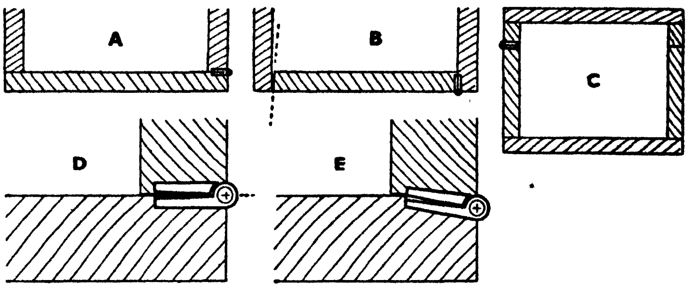


FIG. 129.—SECTIONS THROUGH HINGED JOINTS.

A. Door closes over cupboard sides.
B. Door contained between sides.
C. Box hinge.
D. Hinge let equally into door and cupboard.
E. Hinge let wholly into door.

Fig. 129, the door closes *over* the sides of the cupboard, and in this case the hinge is recessed into the back of the door and the front edge of the side. At *B* the door is contained *between* the sides, and the hinges are let into the edge of the door and the inner side of the cupboard. One point to note here is that the outer or closing edge of the door must be taken off at a slight angle, as shown, as otherwise it will bind when opened. Whenever a single door is hinged, the hinges are fixed at the right-hand side, unless

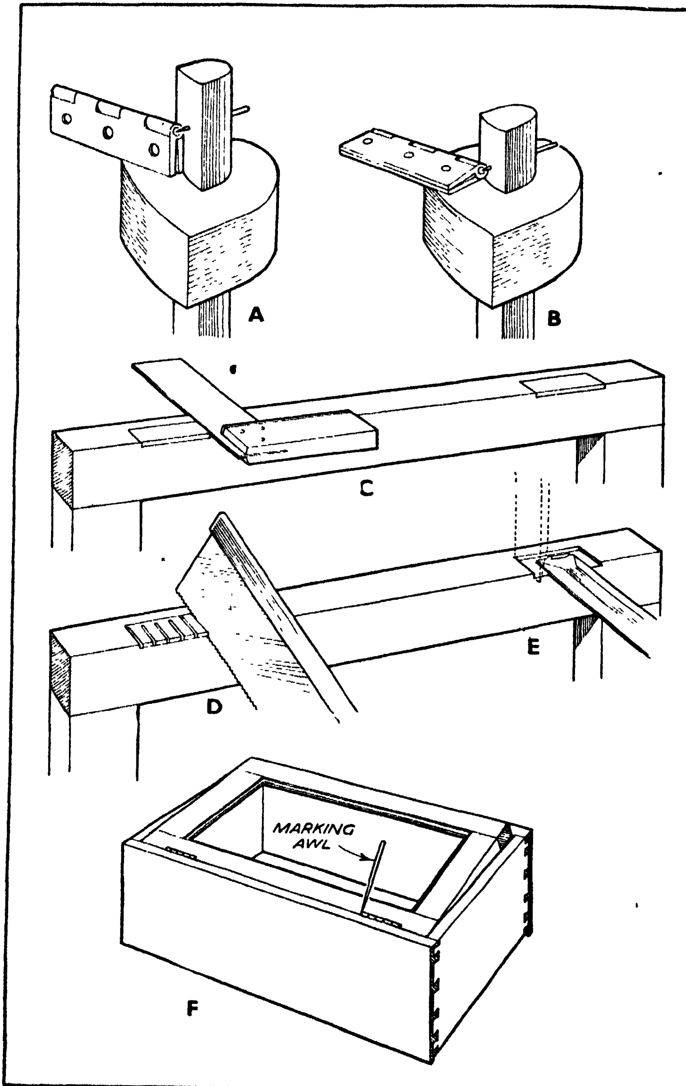


FIG. 130.

there is some special reason to the contrary. The usual way of hingeing a box is given at *C*, the hinges being let into the edges of both lid and box.

As a rule both leaves of the hinge are let in equally as at *D*, and, as most hinges when closed are thicker at the knuckle than at the outer edges, the extent to which they are let in is measured from the knuckle, because it is here that the whole pivoting takes place. In every case, then, the centre of the knuckle is worked to, both in the depth and in the distance in from the edge. *D* shows how this centre lines up with both the outer faces and with the crack between the door and the cupboard.

In some cases it is an advantage to let the hinge wholly into the door as at *E*. Even in this, however, a sloping recess is cut in the cupboard, so that the edge of the leaf is let in. This not only makes a neater finish, but also strengthens it. Note that only the edge is let in (*E*): the knuckle simply rests on the surface.

FITTING THE HINGE

Assuming that the hinges of a door are to be let in equally in both leaves, the first step is to mark the positions in which they are to be fitted. As a general guide, they can be fixed their own length from the end of the door, though this may have to be varied in special circumstances. Place the hinge in position and mark both ends with a pricker or sharp pencil, and square the lines across, as at *C*, Fig. 130.

The depth and distance in from the edge are now

FIG. 130.—STAGES IN FITTING BUTT HINGES.

A. Gauge set to depth.
B. Setting gauge to thickness.
C. Squaring in position of hinges.
D. Preliminary sawing.
E. Chiselling recess.
F. Transferring marks to cupboard.

gauged. If two gauges are available, it is an advantage, so that they can remain set for marking the cupboard. Otherwise re-setting will be necessary. *A* and *B*, Fig. 130,

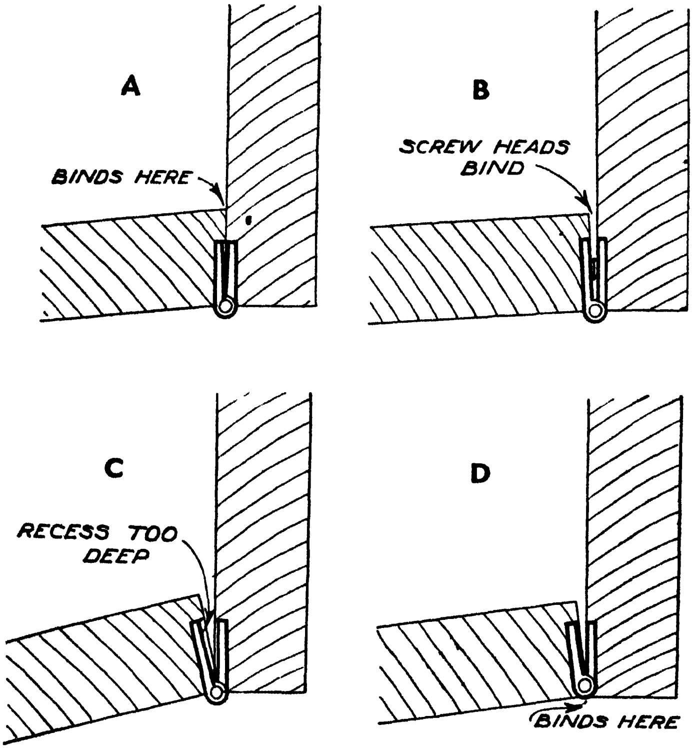


FIG. 131.—TYPICAL FAULTS IN HINGEING.

A. Door edge not square. *B*. Screws too large.
C. Recesses too deep. *D*. Hinge set in too far.

show how the marker points to the centre of the pin in both cases. Mark both the edge and face of the door, take care not to over-run the marks.

With a fine saw cut each line and make a series of cuts

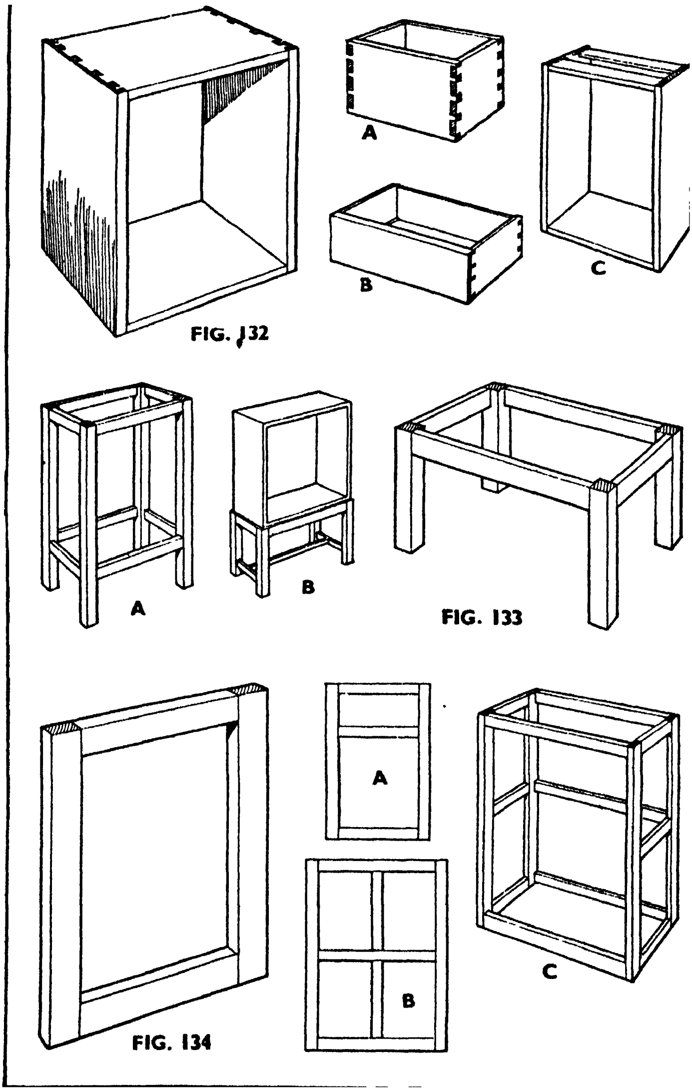
between as at *D*, Fig. 130, so that the grain is cut up short. Now tap the chisel downwards at each end (see dotted lines at *E*, Fig. 130), also at the back, placing the chisel just inside the gauge line. The waste is pared away, and a final cut made right on the gauge line. When the bottom is quite smooth, fix the hinge with a couple of screws only.

To transfer the marks to the cupboard, place the door in position as at *F*, Fig. 130, and mark with a marking-awl or sharp pencil. The recesses are cut and a single screw is driven into each hinge. If any adjustment is needed when the door is closed, a screw can be driven into another hole. The general rule is to put in all remaining screws after the whole has been polished.

FAULTS IN HINGEING

There are various pitfalls in hingeing, the commonest of which are shown in Fig. 131. At *A* the hingeing edge has not been planed square, so that the door will not close. The remedy is obvious. At *B* too large a size of screw has been used, so that the heads bear against each other, causing the door to spring open. If all the screws have been put in, the only plan is to enlarge the countersinking of the hinges. If smaller screws were used, they would probably not grip.

Binding often occurs through the recesses having been cut in too deep as shown at *C*. The best plan here is to put a piece of brown paper beneath the hinge to pack it up. This fault prevents the door from closing properly. If the door binds when opened, the probable cause is that the knuckle is set in too far from the surface as at *D*. The only remedy is to re-screw it so that it stands out more. If necessary, the holes must be plugged to give a grip to the screws.



FIGS. 132–134.—THE THREE MAIN FORMS OF CONSTRUCTION.

Methods of Construction

There are three main methods used in construction, and almost every wooden structure is founded on one of them. Not that there is a rigid line of demarcation between them—many jobs require a compromise between two or even all of them—but it is useful to know the elementary forms and the reason why they have been adopted.

CARCASE OR BOX CONSTRUCTION

This is used for such jobs as a simple box, a drawer, cabinet carcase, and so on. The feature about it is that all the parts are of solid wood (that is, not panelled), and their grain is so arranged that the whole thing shrinks together. For instance, in *A* and *B*, Fig. 132, the grain is horizontal throughout, so that if shrinkage takes place there is no danger of any of the parts splitting. In the same way, the carcase at *C* will shrink from front to back. This is an important point to note, because failure to realise this may cause disastrous results. The point is dealt with more fully on page 148, which explains the shrinking tendency of timber. Nowadays laminated board and plywood are used considerably, and in this case, of course, the direction of the grain does not matter so much, because these materials do not shrink.

The method of jointing the corners depends mainly upon the job itself, but as a rule the dovetail is the most satisfactory. The lapped dovetail is best for most cabinet

FIG. 132.—CARCASE OR BOX CONSTRUCTION.
A. Simple box. *B.* Drawer. *C.* Carcase.

FIG. 133.—STOOL CONSTRUCTION.
A. Cabinet framework. *B.* Stand for cabinet.

FIG. 134.—FRAME CONSTRUCTION.
A. Door. *B.* Cabinet back. *C.* Framed cabinet.

carcases, since the joints cannot be seen at the sides (*C*, Fig. 132). For jobs in which it does not matter whether the joints are seen—a box, for instance (*A*)—the through dovetail is simpler and stronger. In the drawer (*B*) both are used. In some cases the corners can be mitred. The plain lapped joint is a simple alternative to dovetailing, though it is neither so strong nor as neat.

STOOL CONSTRUCTION

This is exemplified in Fig. 133. The rails are jointed to the legs with mortise and tenon joints, and the mortises meet in the thickness of the leg, so that the tenons have maximum length. Dowelling is an alternative form of joint, though it is not so strong. Jobs such as stools, chair-frames and cabinet stands (*B*) are of this form of construction. It is sometimes applied to certain cabinet frames. For example, at *A* the main corner posts are continued to the top, instead of there being a separate stand (*B*), and the rails are jointed to them in the same way as in the stool. China cabinets, some sideboards, tables, and such pieces are made in this way.

FRAME CONSTRUCTION

This form of construction was evolved to avoid the bad effects of shrinkage. The idea is shown in Fig. 134. The strength is provided by the framework, and if the centre portion requires to be filled, a panel of wood or glass is inserted in rebates or grooves in the inner edges of the parts. In the case of a wood panel, the latter is free to shrink in its grooves without affecting the framework. This means that the panel must not be glued in the grooves.

Its application in a door is shown at *A*, and in a cabinet back at *B*. It can also be applied to the main framework

of a cabinet as shown at *C*. This is virtually two side-frames joined together by the front and back rails. The mortise and tenon is the best joint, though here again dowels are often substituted for simplicity. A cabinet made by this method will not shrink from back to front.

Before beginning to make a piece of work, the reader will find it time well spent to consider which of these methods is the most suitable for the work in hand.

Veneering

The use of veneer is very popular at the present time, and is likely to become still more so in the future. In the first place, finely figured woods are becoming increasingly rare, so that it is very expensive to use them in the solid, and it is being realised that in its correct application veneering is not a mere sham, but is a legitimate branch of woodwork carrying with it certain definite advantages. Some woods of beautiful figure are notoriously unreliable—in fact, many of them cannot be used in the solid because of their liability to warp, crack, or because of their weakness. Such woods as burr walnut and the curls in walnut, mahogany, and so on are examples. When used in a thin veneer stuck down on to a plain but sound groundwork, however, they are completely successful.

Then, again, there are many delightful effects impossible except in veneer form. The various built-up designs in which the grain of the parts runs in different directions and in which different kinds of wood are used are obvious cases, and a few of these are shown in Fig. 135. Quartering, crossbanding, and matched panels must be in veneer form. It has to be admitted that veneer is sometimes used in shoddy work to cover up bad workmanship and poor materials, but this is certainly not its correct use. Properly done, a piece of veneered work costs as much as, if not more than, solid wood, and is just as reliable.

Veneering is not difficult to do, and does not call for much in the way of special appliances, but it is essential that the work is done properly if the result is to be a success. The first point to realise is that the groundwork must be sound and be properly prepared. Solid, straight-grained mahogany, or American white-wood, is the ideal ground. Deal is not suitable, because the resin in it prevents the glue from gripping well, and it is liable to

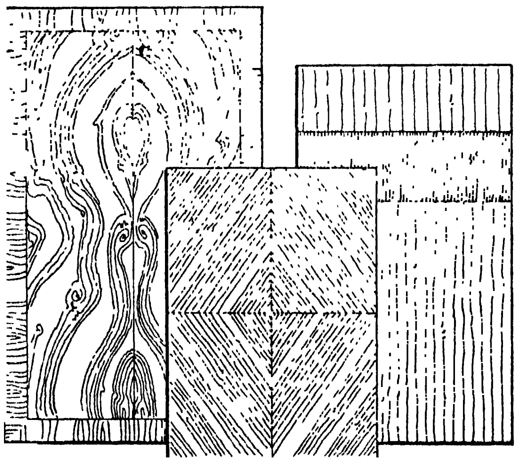


FIG. 135.—EXAMPLES OF BUILT-UP DESIGNS IN VENEER.

soak up too much of the glue. If it is used, a best-quality grade free from knots should be selected, and, to seal the grain, it should be sized with glue thinned down with water. Size should also be used when end grain is veneered, though this is never a very satisfactory thing to do.

An excellent material is laminated board. Plywood, too, gives good results if a good grade is selected. A poor quality is useless, because there are invariably internal

faults which eventually show through to the surface. The veneer should be laid with its grain at right angles with that of the ply, otherwise cracks may develop.

THE PULL OF VENEER

A point to be realised at the outset is that veneer always tends to pull the groundwork hollow. Consequently the ideal arrangement is to veneer both sides so that the pull is equalised. For such a piece of work as a flush door this is really essential, because there is no supporting framework. In the case of, say, a cabinet side or top it

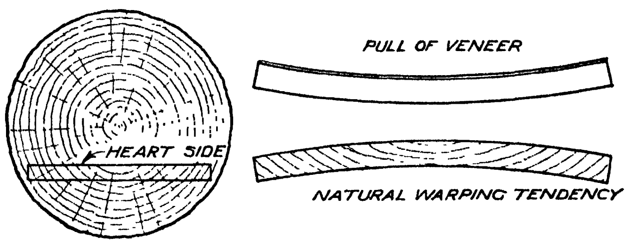


FIG. 136.—HOW PULLING TENDENCY IS MINIMISED.
The warping tendency is opposed to the pull of the veneer, the latter being laid on the heart side.

is not so important, because the framework or carcase helps to hold the groundwork, preventing it from pulling. Even so, steps should be taken to minimise the pull.

To a certain extent this can be done by laying the veneer on the heart side of the groundwork. Fig. 136 explains this. A board, if it is going to twist at all, tends to pull so that the ends turn away from the centre of the log, this being due to the main shrinkage taking place around the annual rings. If, therefore, the veneer is laid on the heart side, the forces are opposed as shown. Another precaution is to damp the groundwork on the underside when veneering. Lastly, the whole thing can be cramped

between flat battens immediately after the veneer is laid, and kept there for several days, and then transferred and screwed to the framework as soon as possible.

KINDS OF VENEER

Nowadays nearly all veneers are knife-cut—that is, they are sliced from the wood by a huge knife, the wood being first steamed to render it pliable. Occasionally they are saw-cut (cut on a huge circular saw), and these are thicker. It is easy to tell a saw-cut veneer by the saw-marks on it, and an important preliminary operation is that of removing the saw-marks before laying. This is done with the toothing-plane, the use of which is described later.

Veneers can be bought in complete leaves, and when matched effects are required, consecutive leaves must be chosen so that the grain is exactly alike. Readers who do small work, however, are advised to obtain a small parcel of mixed veneers in which short ends are included. In this way a good selection can be obtained at small cost.

There are two ways of veneering: the hammer method, and the caul method. The former has the advantage of requiring little in the way of apparatus. Briefly, the groundwork and veneer are glued, the latter is placed in position, and the glue squeezed out with a special form of hammer. To make the glue soft to enable it to be squeezed out, a flat-iron is used to heat it. In the caul method the veneer is glued as before and is placed in position. A caul consisting of a flat piece of wood slightly larger than the groundwork is then cramped down to force out the glue. This method is of particular value for more elaborate built-up patterns, and calls for a number of cramps to enable the veneer to be pressed down.

HAMMER VENEERING

The groundwork is first prepared by planing it dead true. To remove the plane-marks and to roughen the surface to form a key for the glue, a toothing-plane is then worked over the entire surface diagonally, first in one direction and then in the other as shown in Fig. 137. The cutter of this toothing-plane is practically upright, and is scored so that the " edge " presents a series of sharp points. If a plane is not available, a piece of the coarsest

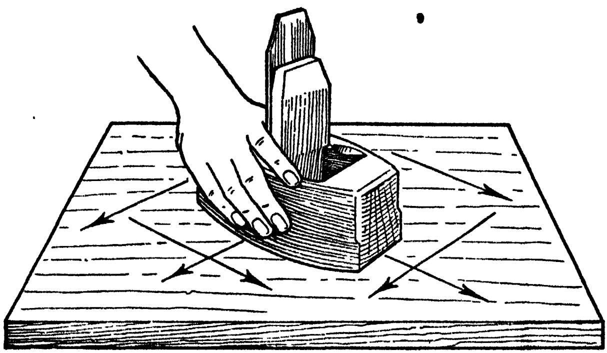


FIG. 137.—USE OF THE TOOTHING-PLANE.
It is worked diagonally, first in one direction and then in the other.

glasspaper can be wrapped round a flat block of wood, care being taken not to dub over the edges. If the groundwork is of softwood, it is then sized and set aside to dry. All dust must be carefully brushed away.

The veneer is next cut to size, and, assuming that it has to cover the entire groundwork, it is cut about $\frac{1}{2}$ in. full all round. A chisel can be used for cutting, the veneer being pressed down on to a flat board with a straight-edge as shown in Fig. 138.

The glue must not be too thick. When thoroughly

warm it should run down freely without breaking into drops from the brush when the latter is held a few inches from the pot. Apply the glue to both the veneer and the

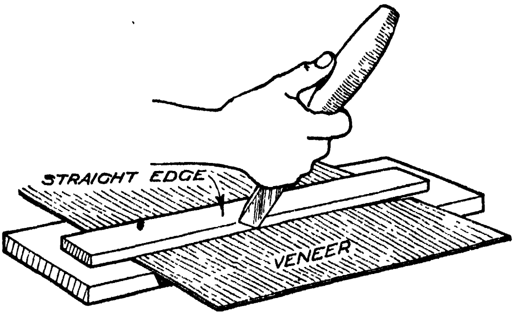


FIG. 138.—CUTTING VENEER WITH CHISEL.

groundwork, and place the former in position, smoothing it out with the hands. It does not matter if the glue chills during the operation.

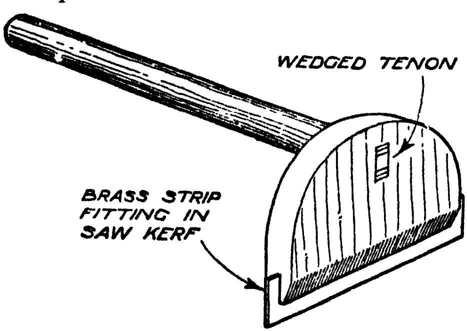


FIG. 139.—DETAILS OF VENEERING HAMMER.
The brass strip can be from 5 to 6 in. long, and about $\frac{1}{16}$ in. thick. The handle is about 9 in. long.

To heat the glue an ordinary domestic flat-iron is used. Do not make it too hot. There should be just a comfortable warmth when held a few inches from the cheek.

With a swab damp about one half of the veneer. This is to prevent the veneer and glue from being scorched; but avoid a surplus of water. Pass the iron over the surface, and then proceed to press out the glue with the veneering hammer (see Fig. 139), working the latter with

FIG. 140.—PRESSING DOWN WITH VENEERING HAMMER.
It is worked from the centre outwards so that the glue is squeezed out at the edges.

a zig-zag movement from the centre outwards. The hammer is shown in use in Fig. 140.

When the one half has been completed, the other can be dealt with similarly. To test whether the veneer is properly down, tap the surface with the finger-nails. It should give a solid feeling. Wipe off any surplus glue

with the swab and cut off the overhang by turning the whole thing upside down on a flat board and cutting round with a chisel. The groundwork must be pressed tightly down. This is shown in Fig. 141.

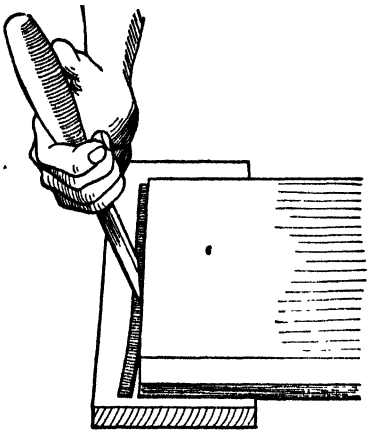


FIG. 141.—TRIMMING EDGES.
The work is placed veneer side down on a flat board and is pressed well down.

Allow plenty of time for the glue to set—at least 24 hours. A scraper is used for cleaning up, after which glass-paper is used, first Fine 2 and then No. $1\frac{1}{2}$.

Sometimes in a wide piece, or when two pieces need matching, a joint has to be made. First lay the one piece, and then the other so that it overlaps the first by about $\frac{1}{2}$ in. Place a straight-edge along the overlap, fix it with a couple of

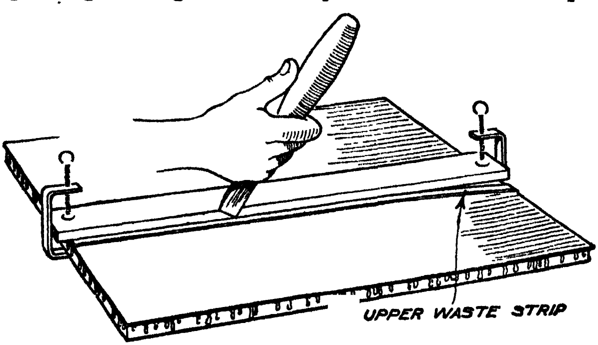


FIG. 142.—MAKING A JOINT IN VENEER.
The chisel cuts through both thicknesses.

thumbscrews, and make a single cut right the way along as in Fig. 142 so that both thicknesses are cut through.

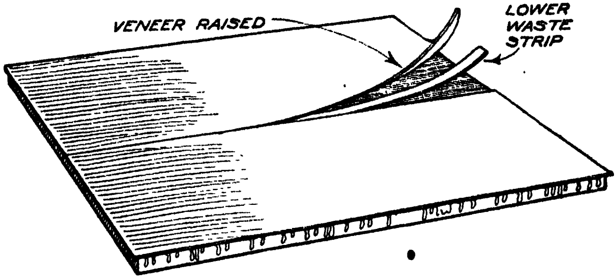


FIG. 143.—JOINTING IN VENEER.
The veneer is raised to allow the lower waste strip to be peeled away.

Remove the straight-edge and peel away the one piece of waste. To get at the other, the veneer must be raised as shown in Fig. 143. It is then heated and rubbed

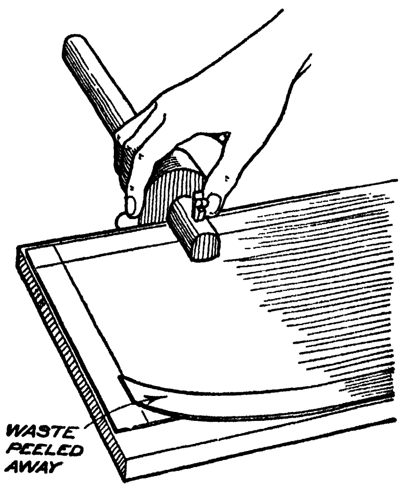


FIG. 144.—LAYING CROSS-BANDING.
Gauging around edges and removing waste.

down finally, a piece of gummed tape being stuck over the joint to prevent it from opening as the glue dries out.

When a panel is to be cross-banded around the sides, the main part of the veneer is cut a trifle small, and, after laying, a cutting-gauge is set to the width of the banding and is worked all round. The waste is then peeled away as shown in Fig. 144. The veneer for the banding can also be cut with the cutting-gauge set a

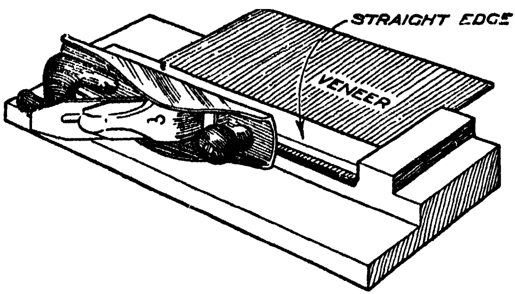


FIG. 145.—TRIMMING EDGES OF VENEER.
The straight-edge or batten prevents the veneer from buckling.

trifle full. The edge is first planed on the shooting-board as shown in Fig. 145, a straight-edge being pressed down on top to prevent buckling. The gauge can be used first from one side and then from the other.

When laying the cross-banding, any jointing, such as the corner mitres and butt joints in the length, is done as the work proceeds. The pene of an ordinary hammer can be used for rubbing down. Gummed tape is stuck over all joints. When cleaning up a cross-banded panel the scraper should be held at an angle, so that there is less tendency for the grain to tear out.

CAUL VENEERING

The groundwork preparation and glueing in this are the same as already described, and when the veneer is in

position, a sheet of newspaper should be placed on top to prevent the caul from adhering. The caul can be any flat piece of wood free from joints. It is thoroughly heated on both sides, and is quickly placed in position. Crossbearers are placed across at each side and the cramps applied as in Fig. 146. As the glue must be driven from

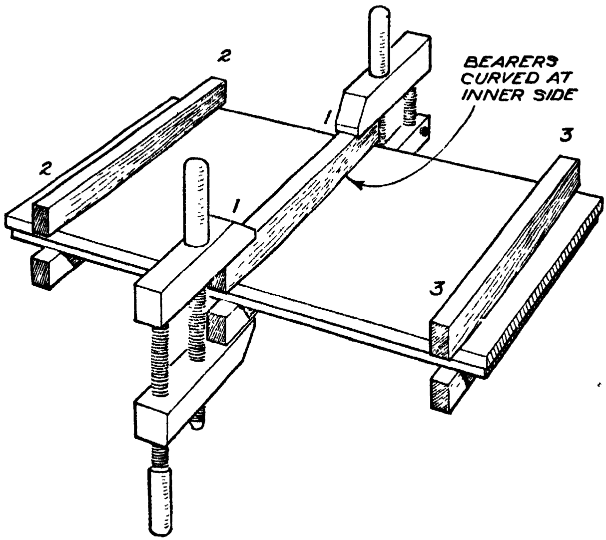


FIG. 146.—VENEERING WITH THE CAUL.
The centre bearers are tightened first so that the glue is squeezed outwards.

the centre outwards, the inner edges of the bearers are made slightly round, so that when the cramps are applied at the ends, the pressure is felt first at the centre. For the same reason, when three or more sets of bearers are used, the centre ones are cramped first.

When a built-up pattern is being made, the whole thing is assembled dry on a design previously drawn out, the joints being planed on the shooting-board. Gummed

tape is stuck over the joints, and it is laid as a whole. To prevent any tendency for the veneer to shift, a couple of fine pins are driven in. The heads can be nipped off first, and they can be punched right home after the glue has set. If centre lines are drawn on both the veneer and the groundwork, it is a simple matter to place the veneer in exactly the right position.

Glue and its Work

For all indoor woodwork the use of glue is strongly advisable, not to say essential. Screws can sometimes be used with advantage, also nails, but the main purpose of the last named is to hold the parts together while the glue sets. Glue properly made and used has tremendous strength.

There are various kinds that can be used. First there is Scotch glue, which must be used hot. In many ways it is the most satisfactory, being extremely strong, but it needs proper use. Any neglect of the few simple precautions may impair its strength by 50 per cent. or more. It is because of the necessity of heating it that many amateurs prefer a cold glue. There are many proprietary makes on the market, and they can be used with every success. One great advantage is that they permit of a longer time being taken in the glueing-up process, and they require no special preparation.

Casein glue is becoming more popular. This is used cold, but, being in powder form, it needs to be made up for each job, as it will not keep till the next day: another quantity has to be made up. It is liable to stain certain hardwoods such as oak and mahogany, and is therefore unsuitable for veneering, as the discoloration works through to the surface. Some makers, however, offer a special form in which this trouble is obviated. The special advantage of casein glue is that it is fairly waterproof,

which makes it suitable for outdoor work, ship models, and so on. Tube glue is handy for small work such as models, but it is not advisable for furniture-making, partly because it is too expensive, and partly because it is not so strong.

Another form of glue which is widely used in the trade today is synthetic resin glue. There are many makes, and its preparation and use depend on the particular variety. Some are used hot, others cold, but the former type is scarcely suitable for home use, because it requires careful regulation of heat and involves the use of special presses. The advantage of resin glue is that it is highly water-resistant and is unaffected by bacteria in humid climates.

One form of glue which is used cold consists of the glue proper, a powder which is mixed with water to form a paste, and a hardener, which is of the consistency of water and is slightly tinted. No setting of the glue takes place until it is brought into contact with the hardener. In use (take a mortise and tenon joint as an example) the glue is applied to the mortise and the tenon is painted with the hardener, and the latter allowed to dry. The two are then put together when setting begins. One useful feature is that hardeners of varying speeds can be used. Thus, for a job involving the assembling of many joints a medium hardener can be used, this giving time for the whole to be put together before the glue sets. A single joint could have a quicker hardener, setting in this case taking place in a matter almost of minutes. It is tricky in use, however, requiring deliberate and certain action. Generally the medium hardener is more suitable for the home workshop.

Another form of cold glue is in single powder form, the hardener being incorporated in it. This requires only to be mixed with water, when it is used like Scotch glue,

except that no heat is necessary. Synthetic glues are not freely obtainable at present, however, their use being mainly in large workshops.

Scotch glue is obtained in cakes, and to prepare it, it should be wrapped up in a piece of sacking and smashed up small. The sacking prevents pieces from flying about. It is placed in the inner container of the glue-pot, covered with water, and allowed to soak overnight. It is then heated, the outer container being half filled with water. Never heat the glue directly over the fire. It will become burnt and lose its strength. Stir it up well until all lumps have disappeared. A guide to the correct consistency is to raise the brush a few inches above the pot. The glue should run down free from lumps, yet without breaking up into drops.

USING GLUE

Now, since glue partly grips by virtue of running into the grain and forming a series of innumerable little dovetails, so to speak, it is obvious that precautions must be taken to prevent it from chilling before it has time to do so. To do this the joining parts should always be heated. When this is done, care must be taken not to burn the edges of joints, as these would show unsightly black lines. Another precaution is to glue up in as warm a room as possible. A third point is to work rapidly, so that the whole process is completed while the glue is still warm.

It is important that the parts of a joint are pressed together so that there is only a minimum of glue actually in the joint. This is ensured in various ways. In rubbed joints (see Chapter II, page 68) the one piece is placed in the vice and the other rubbed back and forth on top, thus squeezing out all surplus glue. Care must be taken not to break the joint. If this should happen, it must be at once rubbed again. This process of rubbing should be

followed whenever practicable, even when cramps are applied.

Some joints, such as the mortise and tenon, mitres, and so on, require cramps. The metal or wood sash cramp is the most convenient form, though the improvised form shown in Fig. 147 can be used successfully for boards. They are put on alternate sides to prevent any twisting tendency. They consist of battens, say 2 in. by 1 in., with a block screwed on at each end. By driving in wedges the joints can be pulled tightly up as shown.

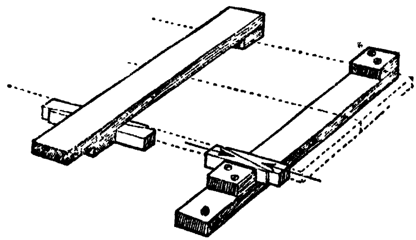


FIG. 147.—IMPROVISED CRAMPS.
They are tightened by means of wedges.

It is important that the work is tested for squareness. An ordinary try-square can be used for small work, or the diagonal strip method shown in Fig. 148 can be used.

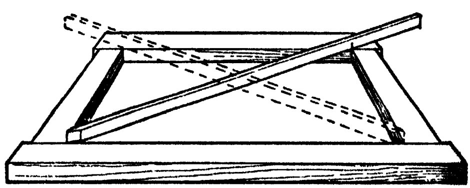


FIG. 148.—TESTING FRAME FOR SQUARENESS.
The diagonal strip should show the same length in both directions.

A strip of wood pointed at one end is laid diagonally across the work and the length marked. It should register the same length when placed in the opposite corners. A test should also be made to see that it is not in winding, and this is done by holding the work level with

the eye. The far and near members should be in the same plane. Fig. 149 shows how the cramps should be adjusted to bring the work true if it should be in winding.

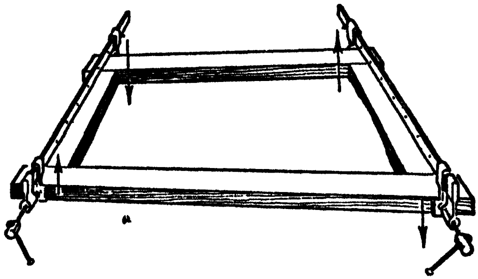


FIG. 149.—GLUEING UP A FRAMEWORK.
Arrows show how cramps should be adjusted to bring frame out of winding.

The arrows show how the cramps should be raised or lowered, as the case may be.

Cleanliness in glueing is important. Although the glue is applied fairly liberally, it should not be allowed to drop and splash where it is not wanted. Inevitably, a certain amount will be squeezed out, and this should be wiped off with a damp swab or scraped away with a chisel before it sets. It is far easier to remove it while it is still soft.

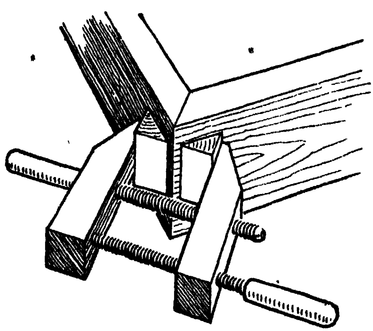


FIG. 150.—CRAMPING A MITRE.
The glued-on blocks provide a bearing for the handscrew.

Some jobs create a difficulty owing to there being no surface to which cramps can be applied. The mitre is an

example. Fig. 150 shows how this can be dealt with. Blocks of wood are glued on temporarily and the cramps tightened over these. When the glue has set, they are knocked off. Springs are handy for applying pressure on an irregular surface, and they can be made simply from old upholstery springs, being cut up into suitable lengths and put on as in Fig. 151. For small work spring paper-clips or spring clothes-pegs can often be used.

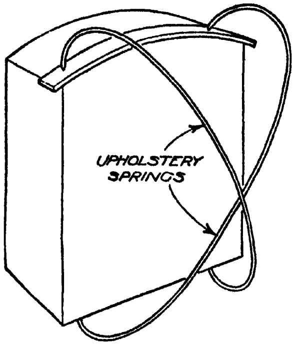


FIG. 151.—CRAMPING IRREGULAR SURFACES.

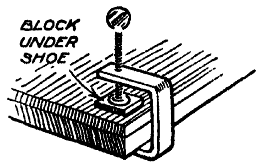


FIG. 152.—THE THUMBSCREW. Block prevents surface from being damaged.

One last point to note is that blocks of wood should be placed under the shoes of thumbscrews and similar cramps to prevent the surface of the wood from being damaged. This is shown in Fig. 152.

MATERIALS

One may conveniently divide the woods used in carpentry under two headings, softwoods and hardwoods. The former are used for outdoor structures, the inner parts of cabinets, and for kitchen furniture which does not call for a high finish. Hardwoods are needed mostly in furniture-making. An important difference between the two is that softwoods are sold "per foot run," whilst hardwoods are bought "per super foot." Thus, assuming

a board of softwood to be 10 ft. long by 9 in. wide, and its price 4*d.* per foot, its cost would be ten times 4*d.*—that is 3*s.* 4*d.* In other words, the cost of a board is its length in feet multiplied by the price per foot. The width is disregarded.

Hardwoods, on the other hand, are sold at so much per square foot, so that the width enters into the calculation. A piece 1 ft. long by 1 ft. wide has an area of 1 square foot. So also has a board 2 ft. long by 6 in. wide; or one 1 ft. 6 in. long by 8 in. wide. To take a parallel case of a board of hardwood 10 ft. long by 9 in. wide at 4*d.* per foot super the cost would be 2*s.* 6*d.* This is arrived at by taking the length in feet (10), multiplying by the width in inches (9), and the price per foot (4), and dividing by 12.

Thus $\frac{10 \times 9 \times 4}{12} = 30 = 2s.\ 6d.$

Another point regarding the price of hardwoods is that it varies according to the width. A board 12 in. wide costs more in proportion per foot super than one 7 in. wide. The merchant quotes the price per foot super in a width of so and so. Consequently if only narrow strips of timber are required, it is cheaper to order comparatively narrow boards from which the stuff can be cut.

The amateur is sometimes fogged by the thickness of his timber. He orders, say, a 1-in. board, and is surprised to find that it is only $\frac{7}{8}$ in. thick. The reason is that thicknesses in the timber trade are known as nominal. The usual plan is to cut up a log into pieces 3 in. thick, but be it observed that it is impossible to cut three 1-in. boards from this. The thickness of the saw kerfs has to come out of it, and, in the case of planed timber, the waste removed in planing comes out. Hence a board of nominal 1 in. thickness measures only about $\frac{7}{8}$ in.

A great deal of unnecessary waste in ordering timber can be avoided by taking into consideration the standard

sizes of timber. If, for example, a finished thickness of 1 in. is required, it is necessary to plane down a 1¼-in. board, and the buyer has to pay for the waste. In most cases a ⅞-in. thickness would do as well. Then there are the widths to consider. The point about the narrower widths of hardwood costing less in proportion has already been mentioned. In addition, if a width of, say, 18 in. of softwood is required, two pieces 9½ in. wide can be jointed up with a minimum of waste, whereas 10½-in. pieces would require a comparatively wide strip to be cut off to waste. On this score, however, it should be remembered that there is a certain amount of shrinkage in softwoods which reduces the width. Thus a 10-in. board will usually be no more than 9⅝ in. in width.

Amongst the softwoods, red and yellow deal are used for outdoor woodwork and (in better qualities) for the carcase work of furniture. It is a cheap wood, but has a fair sprinkling of knots (more or less according to the quality). It does well for shelvings, partitions, and similar jobs, but is unsuitable for good work, because of its liability to cast. An excellent timber is Siberian Pine, being free from knots and reliable, though it costs considerably more than plain deal. Western Red Cedar, too, is a fine, reliable wood coming in for increasing use. Like everything else, one has to pay for quality in timber.

Amongst the hardwoods, oak is used probably the most, and there are many varieties of it. The best is undoubtedly English oak, but it is costly to buy. A good substitute is Japanese oak, which is suitable for most jobs the reader is likely to tackle. American oak is not so good a wood, but is often used because of its cheapness. It is plain—that is, not figured—because of the way it is cut from the log. Care should be taken when selecting it, because it is liable to cast.

Figured oak is better from every point of view. For

one thing its figure is very attractive, and for another it is more reliable. The reason is that for a board to be figured at all it must be cut radially from the log, or nearly so, because the figure is derived from the medullary rays which radiate from the centre. Fig. 153 makes this clear. Now, since most shrinkage takes place around the annual rings, plain boards which are cut as in Fig. 154 tend to twist away at the edges from the centre or heart.

FIG. 153.

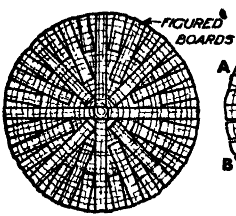


FIG. 154.

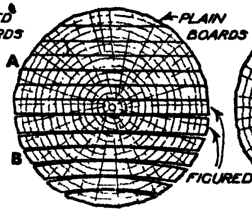


FIG. 155.

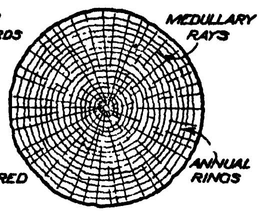


FIG. 153.—LOG CUT TO PRODUCE FIGURED OAK BOARDS.
FIG. 154.—PLAIN OAK BOARDS. The centre boards are figured as they run radially from centre.
FIG. 155.—SECTION THROUGH LOG. This shows the medullary rays and the annual rings.

On the other hand, boards cut to radiate from the centre as in Fig. 155 have no tendency to twist one way or the other.

Mahogany is not so popular as it used to be, but is an excellent furniture material, being sound, reliable, and able to hold glue well. Honduras mahogany is excellent, though the African varieties are being used considerably. Here again the price is mostly governed by the quality of the timber.

Walnut has a wide use nowadays. The American variety is mainly used in the solid, because the finer European walnuts are becoming increasingly rare and correspondingly expensive. It is used mostly for such parts as legs, which must be cut in the solid. The larger

panels are invariably veneered because this is the only way in which finely figured walnut can be obtained.

Satin walnut is used as a cheaper substitute, and has the advantage of being obtainable in wide boards. As a matter of fact, it is not a walnut at all, being one of the gum varieties, and is altogether an inferior wood.

An excellent wood is American whitewood. It stains well to imitate other hardwoods, and is reliable. As a groundwork for veneer it is one of the best woods available amongst the cheaper kinds. There are, of course, innumerable other woods which the reader may come across occasionally, but they do not normally come his way.

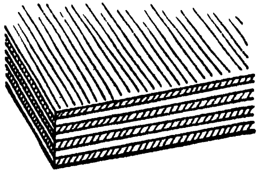


FIG. 156.—PLYWOOD. It is made up of seven layers.

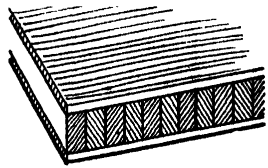


FIG. 157.—LAMINATED BOARD. How it is built up.

Apart from solid wood, there is plywood and laminated board, both excellent for certain work. The extreme widths in which they are available, their strength across the grain, and their freedom from shrinkage make them invaluable. Plywood in the thinner thicknesses—up to, say, ¼ in.—is generally in three plies, the centre layer running at right angles to those outside. Thicker ones are made up of five, seven, nine, or more plies (see Fig. 156). The quality fixes the price, and it cannot be too strongly emphasised that for a good-quality piece of work the best should be used. Very cheap plywood such as that used for making tea-chests is useless for furniture-making. Faults may develop later, often owing to bad joints in the centre layer which cause the outer plies to sink in.

All plywood can be obtained ready veneered with oak, mahogany, walnut, silky oak, and so on, and in this form it is useful for panels. The layers necessarily show at the edges, and this makes the addition of a lipping essential in some jobs. It is often better to obtain plain plywood, lip the edges, and veneer afterwards.

Laminated board is excellent for veneered work, as it makes a reliable groundwork. It is built up as shown in Fig. 157. There are standard sizes of both plywood and laminated board, but, as the reader is likely to purchase his requirements locally, he is advised to see what sizes the merchant stocks before beginning a piece of work. By a little adaptation he will often be able to avoid a great deal of waste by making his job to suit the sizes available.

Block board is another type of laminated board, but the core strips are wider. Batten board has still wider strips. For the best work, especially that to be veneered, lamin board is the most reliable.

Wood Finishing

A finish of some sort is desirable on any piece of woodwork, partly because bare wood rapidly becomes soiled with use, and partly because a polish serves to seal the grain. Wood is a live organism, and is liable to take in moisture from the air and so swell, or to part with it and so shrink. The effect of polishing is to seal the surface and so prevent, or largely minimise, the effect of a varying atmosphere.

Sometimes the polish is applied directly to the wood, but more often it is first stained. There is a tendency nowadays to eliminate the staining, and if the same kind of wood is used throughout, the result is quite successful. Sometimes it happens that different kinds of, say, oak have been used, and the tone thus varies. In this case a

stain is desirable so that the whole tones down to a common shade.

One form of finish generally known as a varnish stain has the effect of colouring and giving a shine in one operation, but it is not recommended for good work, because the colouring matter is contained in the varnish and has the effect of hiding the grain. It is not really a stain at all. It is useful for finishing deal in which the grain does not matter much, and in renovating old chairs and similar pieces which have become shabby. For new work a preliminary stain followed by polish is better.

STAINS

There are many excellent proprietary stains on the market and the reader cannot do better than use these. Instructions on their use are supplied with the stains, and these should be followed implicitly. Some in particular are of an oily nature, and it is imperative that plenty of time is allowed for them to dry out thoroughly before any polish is applied. Otherwise there may be trouble owing to the polish not drying, or to the oil soaking through and causing it to become dull.

Stains can also be made up by the reader himself. Aniline dyes give good results, and various shades can be mixed together to produce any special colour. They are in powder form, and can be obtained soluble in either methylated spirit or water. A thorough mixing is essential, and they should be allowed to stand for several hours before use. A little french polish can be added to the spirit stain to act as a binder. The spirit stain is not so liable to raise the grain as the water variety.

A cheap stain can be made from Vandyke crystals. These are dissolved in warm water, the amount depending upon the shade required. A little glue size is added while it is still warm to bind it. It gives a medium brown

shade. Another good stain is made from Asphaltum. This is dissolved in turpentine and, after straining, a little gold size is added. It gives a brown shade which is useful for imitating oak or walnut, and is of value chiefly for deal.

Oak is best darkened by fuming, because, since no liquid is applied, the grain is not raised. The work is placed in a cupboard with a close-fitting door, and the ammonia (known as " point eight eighty ") is poured into a saucer. The time it remains in the cupboard depends upon the shade required and the size of the cupboard. It may vary from fifteen minutes up to several hours. Great care must be taken not to bend over the ammonia, because the fumes are very strong. The work is best done out in the open. Since some varieties of oak are more susceptible to the fumes than others (American oak is scarcely affected), it is important that the same kind of oak be used throughout.

Alternatively, any of the proprietary stains can be used, or those made up with aniline dyes. Permanganate of potash is sometimes used, but it is not permanent, the colour gradually changing in the course of time.

An excellent plan for mahogany is to use bichromate of potash, which darkens the wood by chemical action rather than by staining. This is in crystal form, and the crystals are placed in water. The latter will gradually turn a reddish-orange shade. It is applied to the wood by daylight and allowed to dry out. The wood will turn a brown shade free from the objectionable reddish shade often seen in mahogany furniture. A yellowish dust is left on the surface, and this is wiped off before polishing. Aniline dyes or proprietary stains can also be used. Walnut is best usually left without staining, though any of the marketed stains or aniline dyes can be used.

It is inevitable that water and spirit stains will raise

the grain to a certain extent, and to minimise this the work should first be damped with water and allowed to dry. The surface can then be glasspapered smooth. When the stain is applied, the grain will rise to only a small extent.

Brushes are needed for staining, also a rag. The stain is applied *with* the grain, and the edges should be kept alive so that patches are avoided. To get rid of brush-marks the rag is soaked in the stain, wrung out, and wiped over the surface in long, even strokes. When staining a piece of panelling such as a door, the panels should be stained first. Start at one side, not the middle, so that there is only one edge to keep alive. Now stain the framing, carrying the stain cleanly up to the joints of the horizontal rails, and finishing off at the uprights as shown in Fig. 158. The mouldings are picked in lastly with a small brush. Generally it is better to give two weak coats of stain rather than one strong one. The first must dry out thoroughly and be lightly glasspapered smooth before the second is applied.

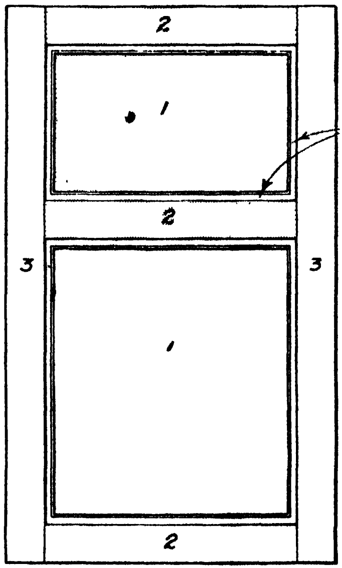


FIG. 158.—STAINING A DOOR. Figures show order in which parts should be stained.

One point to note (and this applies equally to polishing) is that when possible the parts should be separated. For instance, panels are more easily dealt with before being

fixed in the framework. If this is not possible, the edges should be stained before fixing, so that in the event of shrinkage there will not be any white gaps as the panel draws out of the grooves.

If for any reason a part of the work is of too dark a shade, it can be bleached with oxalic acid. This is a powder, and it is dissolved in warm water, about 1 oz. of acid to half a pint of water. It is applied to the work, several times if necessary. Sometimes a swab soaked in the acid can be left on the work if the dark patch is local. Afterwards it should be well washed with water to get rid of the acid, as the latter may have a bad effect upon any polish to be applied later. It is also a good plan to wipe over such parts with vinegar to neutralise the acid. As the acid is a poison, care should be taken to wash the fingers afterwards.

Some proprietary stains have preservative qualities which make them specially useful for outdoor woodwork, and these should certainly be used for jobs liable to be exposed to the weather. For floorboards the Vandyke crystals already mentioned are suitable, and have the advantage of cheapness. If the floor is not new it should be washed thoroughly first with warm water in which a few lumps of soda have been dissolved to get rid of any grease.

WAX POLISH

A polish which dates back for centuries and which has recently become popular is wax polish. It gives a somewhat dull, eggshell finish which looks especially well on oak and walnut. It has two great advantages: it is inexpensive and is easy to apply.

Two kinds of wax are available, yellow and white, and the reader can decide which is the more suitable for his

purpose. For a light wood which is to be kept as light as possible the white is the better. It should be shredded into a tin, just covered with turpentine, and allowed to dissolve. The process can be quickened by standing the tin in hot water. Never place it over a flame; it will inevitably flare up. When ready it should be in the form of a paste of medium consistency, and is applied either with a brush or a rag. The brush is handy for working into corners and dealing with carved work.

The wood must be quite dry, and, in the event of its having been stained with an oil stain, plenty of time should elapse before the wax is applied. It is a good plan to rub over the surface with a rag to remove any traces of oil. At least twenty-four hours should be allowed for the turpentine to evaporate, after which the whole can be polished with a rubber free from fluff. Probably the first application will not produce much of a shine, but the advantage of wax polishing is that it can be repeated at any time.

FRENCH POLISH

This is a job calling for considerably more experience than wax polishing, and the reader is advised not to make a good piece of work his first effort. It is far better to practise on a spare piece of wood.

The first step after the wood has been stained is to fill in the grain. Proprietary fillers can be obtained, and they give excellent results. Alternatively, a filler can be made from whiting. This is dried and a little powder colour added to take off the whiteness. Rose-pink is suitable for mahogany and umber for oak or walnut. This is mixed in thoroughly and turpentine added a little at a time to bring it to a paste. The addition of a little gold size helps, as it acts as a binder. The filler is applied with a rag

across the grain so that the pores are well filled in, and allowed to stand until it becomes tacky. The surplus can then be wiped off the surface. Special care must be taken to clean out corners, mouldings, and so on, and a little piece of stick is handy for this.

The work is set aside to harden, and then smoothed with fine, worn glasspaper. In all stages of french polishing allow plenty of time between each process. This is one of the secrets of successful polishing. A rag dipped in linseed oil is now worked over the surface and it is once again allowed to dry out. The effect of this is to kill any whiteness in the filler, but it *must dry out thoroughly.* Several days should be allowed if possible.

A piece of flour-grade glasspaper is next rubbed over the surface to remove any filler and to smooth it. The necessity of wiping off the surplus in the preliminary filling is appreciated at this stage. The french polish can be obtained ready made, or it can be made up as follows. In a pint of methylated spirit dissolve about 7 oz. of orange shellac (or bleached shellac if a white polish is required). This will take some considerable time, and to speed it up the bottle should be frequently shaken.

The rubber is made up of a little wad of cotton wool with the skin removed. It is charged with polish and moulded into a pear shape. A piece of fine muslin is used to cover it, and it should be so wrapped round it that the sole is free from all creases. Every time the rubber needs re-charging the cover should be taken off, the cotton wool placed over the top of the bottle, and the latter inverted. The rubber should exude a *little* polish when pressed, but on no account should it be too fully charged. It is not the amount of polish applied that produces the shine, but the work put into the rubbing.

In the opening stages the polish can be applied a little more generously, because it is bound to soak into the

grain. Work the rubber with a circular motion, taking special care at the corners. Polishers have a saying that if the corners are attended to the middle will take care of itself. Work out the rubber until it is dry, and then go over another part of the job. It is always an advantage to polish several articles at the same time, because some can be hardening whilst others are being dealt with.

After a couple of hours or so the surface is rubbed lightly down with the finest worn glasspaper. Two pieces can be rubbed together to take off the cut of the new glasspaper. Now give a second coat of polish, continuing the circular motion as shown in Fig. 159, and work the rubber until it is practically dry. If it begins to drag, a single spot of linseed oil can be applied to the sole with the finger. Avoid too much oil, however, because it prevents a high gloss, and it has all to be worked out later. Once again set the work aside and proceed with another part of the job. The time allowed between the successive rubbings is most important.

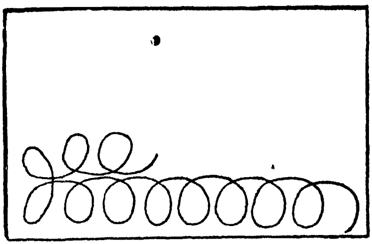


FIG. 159.—FRENCH POLISHING. The circular path of the rubber when bodying up.

Proceeding in this way a good body will gradually be built up. One of the secrets is in knowing just when to stop and leave the work to harden, and this is a thing which comes only with experience. If the rubbing is continued too long the rubber will begin to drag off the polish already applied. When a fair shine has been attained the circular movement is changed for long, even strokes *with* the grain. Between the application of each coat rub the surface down with the worn glasspaper.

The final stage is known as spiriting off, and it is one which requires the utmost care. Make a fresh rubber and sprinkle on the cotton wool a couple of drops of methylated spirit—no more. Work this well into the cotton wool so that it is evenly distributed, and, wrapping round the cover, work it along the surface in long, even strokes. The object of this is to remove all traces of oil

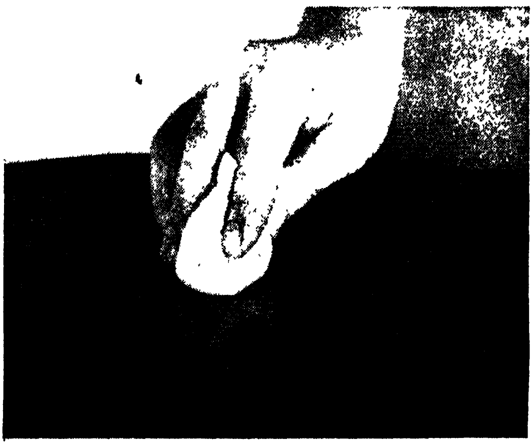


FIG. 160.—HOW FRENCH-POLISHING RUBBER IS HELD.
It should be moulded to a pear shape.

and to burnish the surface. After a few rubs the sole of the rubber will be greasy with oil and the cover should be moved so that a fresh, clean part covers the sole. Work the rubber until it is quite dry, and if the process has been done properly a brilliant shine will be the result. When the polish has hardened the process can be repeated. Note that only the slightest trace of spirit should be used. If the rubber is really damp it will drag off the polish and ruin the work.

Fig. 160 shows how the rubber is held. A pear shape

allows a pointed corner at the front which will work into the corners. When finished with for the night, rubbers should be kept in an air-tight tin.

VARNISHING

This is used for outdoor woodwork, and interior fitments, but is unsuitable for furniture, on which the more refined finish of french polish is better. A clear varnish can be applied over woodwork to show the grain, or it may be applied over paint. Generally speaking, oil varnish is more suitable for outdoor work and for that liable to be subject to sunshine, because it is more elastic than the harder spirit varnish. It takes longer to dry, but from the point of view of its working this is an advantage.

To apply varnish directly over a bare wood surface involves difficulties because of the liability for it to soak into the grain. The latter requires sealing, and this is best done with glue size. This is painted on evenly and allowed to harden thoroughly, after which it is rubbed down smooth with glasspaper.

Special brushes are available for varnishing. A fairly wide, flat one is needed for panels, and a small one for picking in mouldings. The brush is dipped into the varnish and wiped out flat against the side of the pot. Just the tips are then dipped in again, and the coating started at one side. Work *with* the grain and spread the varnish equally over the surface with up and down strokes. When the surface has been covered, the brush should be wiped out cleanly against the side of the pot, and drawn over the surface with just the tips touching, and working in long strokes right across the surface in one direction only.

The first coat can be fairly full, and the second and third coats lighter. Plenty of time should be allowed

between each, and the work after each application should be rubbed down with powdered pumice-stone and water, using a piece of felt as a rubber. In panelled work the method suggested for staining in Fig. 158 can be followed.

Spirit varnish is rather more difficult to apply than oil varnish, at any rate on large surfaces. It dries quickly, and it is not easy to produce a flat surface, because the edge may dry before the adjoining portion is dealt with. In addition, the brush marks do not flow out evenly. The surface should be well rubbed down between each coat.

Cellulose lacquer is useful for small articles, but is not recommended for large surfaces because of the difficulty of joining up. It dries rapidly, so that the edges dry before the adjoining part can be joined up to it. On the other hand, for small work such as models, it produces a fine gloss and the brush-marks flow out perfectly smooth. There is no need to seal the grain, because the first coat acts as a sealer. When dry it should be rubbed down smooth with pumice powder applied with a piece of felt, and a second coat given. If possible the surface should be laid flat, to prevent any tendency to run. At least two coats should be given. It should never be applied over fresh paint.

CHAPTER IV

SMALL ITEMS TO MAKE

Book-Ends and Book-Troughs

DESIGN A

It is surprising what effective book-ends can be made from odd scraps of wood. Fig. 161 is a good example. It could be made with a combination of walnut and oak; mahogany and birch or other light wood; or with one wood only, some of the parts being stained darker than others. The plates passing beneath the books are of metal. These can be obtained ready made, pierced for the screws, or they can be cut out of sheet brass or iron and be painted black.

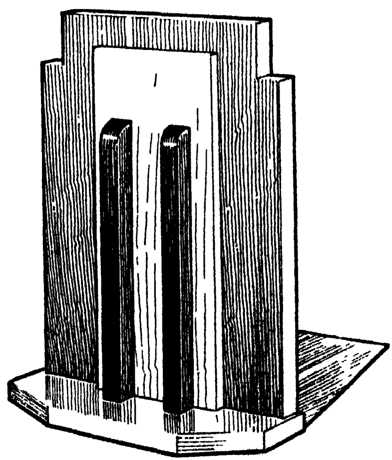


Fig. 161.—Book-Ends. Design *A*.

Cut out the main upright piece from ½-in. wood to finish 8 in. by 6 in. as in Fig. 162, trimming the edges square with the plane. Mark out the top corners and saw them away, cleaning up afterwards with the chisel, and finishing off with glasspaper wrapped round a square piece of wood. The oblong panel applied to it is ¼ in. thick and is trimmed up square to the sizes given. The two dark buttress pieces are ½ in. square in section, and the top corners are rounded over with the chisel and smoothed

with glasspaper. If the latter is held on a flat piece of wood and is given a rounding movement, all corners will be cleaned off.

For the base, $\frac{1}{2}$-in. wood again is used, and the canted corners are marked in $1\frac{3}{8}$ in. along the length and $\frac{5}{8}$ in. across the short way. They are sawn off and planed smooth. All parts should be glasspapered smooth ready for staining.

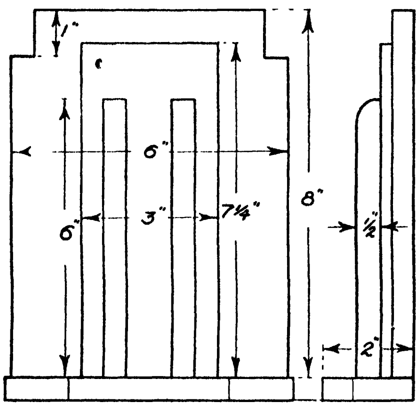


FIG. 162.—FRONT AND SIDE ELEVATIONS. DESIGN *A*.

If the same kind of wood is used throughout, the main upright piece should be stained. In any case the buttress pieces must be stained black. Aniline dye is suitable for this. The whole thing can now be assembled, unless it is intended to french polish it, in which case the work is simplified if this is done first. Note, however, that all polish should be scraped away where the glue is applied, because the latter will not grip over polish.

When dry, the parts are lightly glasspapered, and the positions where they are to be fixed are pencilled in. Begin by fixing the oblong panel to the main upright,

glueing the back and driving in nails where the buttress pieces are to be. In this way the nails will be hidden. It is a good plan to fix them between flat boards and to put a heavy weight on top. The buttress pieces also are glued, and a single fine nail is driven in at each end. These can be punched in and the holes filled with plastic wood. Use three long fine screws to fix the base to the uprights. They must be long, as they are running into end grain. The whole thing is now wax-polished and the metal bottom plates are screwed on.

CUTTING LIST

Design A

	Length.	Width.	Thickness.
2 Uprights . .	8¼ in.	6⅛ in.	½ in.
2 Panels . .	7½ ,,	3⅛ ,,	¼ ,,
4 Buttresses . .	6¼ ,,	½ ,,	½ ,,
2 Bases . . .	6½ ,,	2⅛ ,,	½ ,,
	2 Metal Plates.		

DESIGN B

The second design in Fig. 163 is as simple to make as the first. Practically any hardwood could be used, the buttress pieces being stained black. It is as well to use a close-grained wood for the buttresses, as this gives a better imitation of ebony. For the main upright use ¾-in. wood, planing the edges square to the sizes given in Fig. 164.

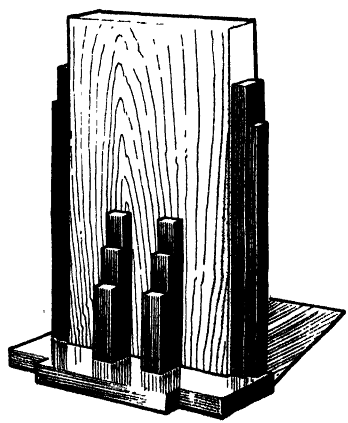


FIG. 163.—BOOK-ENDS. DESIGN *B*.

The side buttresses are plain strips of wood cut to length and glasspapered smooth. Those at the ends are stepped as shown, a saw being used to cut away the waste. Clean up afterwards with glasspaper wrapped round a square stick. Half-inch stuff is used for the base, and the outer ends are cut in to the extent of 1 in. by ⅜ in.

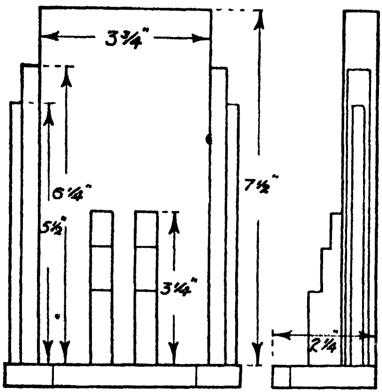


FIG. 164.—MAIN SIZES. DESIGN *B*.

Having stained the parts, they are assembled with glue and nails. The last named are punched in and the holes filled in with plastic wood. Long, thin screws are used for fixing the base as before. It then remains but to wax-polish the whole and screw on the metal plates. Actually it is an advantage to let in these plates so that they are flush underneath, but it is not essential. The screws, however, must be countersunk.

CUTTING LIST

Design B

	Length.	Width.	Thickness.
2 Uprights . .	7¾ in.	3⅞ in.	¾ in.
4 Buttresses . .	6½ ,,	½ ,,	⅜ ,,
4 ,, . .	5¾ ,,	¼ ,,	¼ ,,
4 ,, . .	3½ ,,	¾ ,,	½ ,,
2 Bases . . .	5½ ,,	2⅜ ,,	½ ,,
2 Metal Plates.			

DESIGN C

The book-ends in Fig. 165 are in somewhat different style, being veneered and decorated with cross-banding. They would look well in either mahogany or walnut. For the groundwork use mahogany for a mahogany job and American whitewood for one in walnut. It is $\frac{5}{8}$ in. thick.

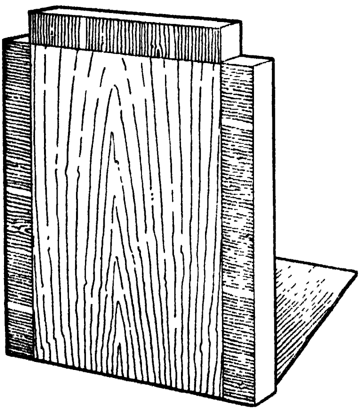


FIG. 165.—BOOK-ENDS. DESIGN *C*.

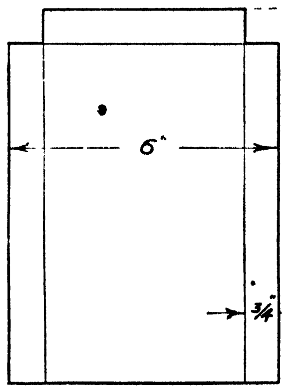


FIG. 166.—ELEVATIONS. DESIGN *C*.

CUTTING LIST

Design C

	Length.	Width.	Thickness.
2 Uprights . .	$8\frac{1}{4}$ in.	$6\frac{1}{8}$ in.	$\frac{5}{8}$ in.

Veneer also is required and 2 Metal Plates.

Cut it out to the over-all size (Fig. 166) and trim the edges square. A toothing-plane is used to give a key to the glue (see chapter on veneering), or, failing this, a piece of the coarsest glasspaper held on a flat block. Both sides are treated, because if veneered on one side only, the veneer is likely to pull the wood hollow.

Now cut out pieces of veneer about $\frac{1}{4}$ in. short at the sides and top, but to overhang $\frac{1}{4}$ in. at the bottom. Either the veneering hammer can be used, or the glue can be pressed out with hot cauls cramped on. If the latter method is used, remember to put a piece of newspaper beneath the caul to prevent the latter from adhering. Before the glue hardens set a cutting-gauge to $\frac{3}{4}$ in. and gauge round the top and sides. There is no need to

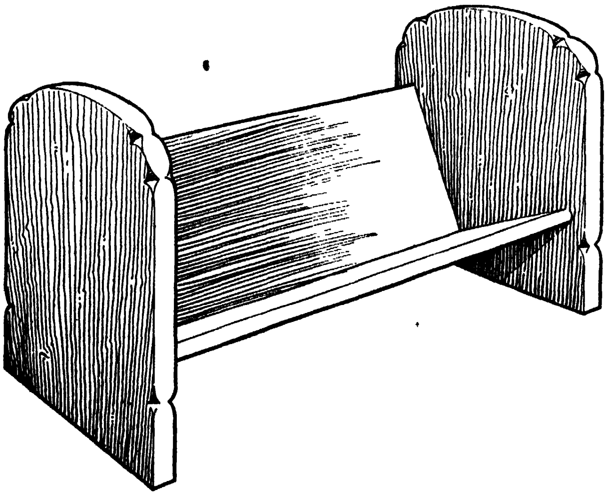


Fig. 167.—Book-Trough in Oak. Design *D*.

cross-band the inner side, and here the veneer should be made to overhang all round. This overhang must be cut off before the gauge can be used. The waste will peel away easily if a chisel is worked beneath it.

Cut out the strips for the cross-banding about $\frac{7}{8}$ in. wide, and lay one piece along the top. Then cut off the ends level with the gauge lines, and lay the pieces at the sides. Pieces of paper are glued over the joints, or lengths of gummed tape can be used.

When the glue has set, the edges are trimmed. The bulk can be chiselled away, after which a plane is used. Now clean up the surfaces with the scraper and finish with glasspaper, first No. Fine 2 and then No. 1. The top corners are sawn away in line with the cross-banding and smoothed with glasspaper. The polishing and addition of the metal plates complete the whole thing.

DESIGN D

Fig. 167 shows a book-trough that is interesting to make and of attractive appearance. Oak is the most suitable

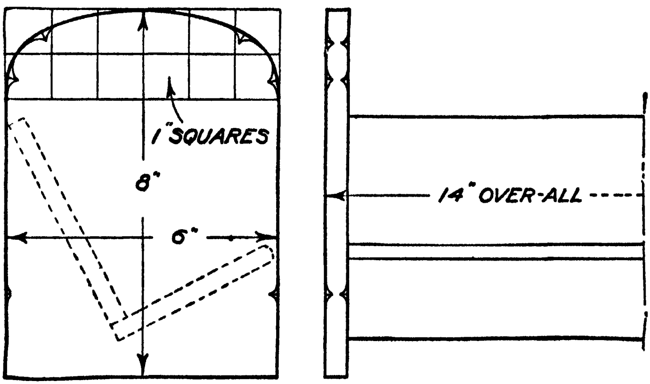


FIG. 168.—END VIEW AND FRONT ELEVATION. DESIGN *D*.

wood to use. The best way of making it is to cut either a series of mortises or grooves in the sides, and corresponding tenons or projections on the back and bottom. The simpler alternative is simply to butt the parts together, fixing them with glue and nails.

The first step is to cut out the sides to the sizes given in Fig. 168. The top shape can be plotted out by drawing in squares and copying the curve in the manner of map-drawing. If a bow-saw is available, this can be used to cut the curve. Failing this, a tenon-saw can be used by

making a number of straight cuts as close up to the line as possible. The corners can be chiselled away and the shape finished with the spokeshave. The position of the back and bottom is drawn in, using a square, and if mortises or grooves are used, these can be cut.

The back and bottom are squared up both to exactly the same length. Tenons can be cut if needed, or, in the event of grooves being cut in the sides, a shoulder can be cut at top and bottom to give a neat finish. In either case remember to allow extra length for the joints. When being butted they are merely planed square at the ends.

The decoration at the edges of the sides is done entirely with the chisel. Pencil in the positions of the recesses, and make a deep cut with the chisel at the centre of each. The chisel edge, of course, lies across the grain. Now ease away the wood first at one side and then at the other. At the start of the cut the chisel lies almost flat, and the handle is raised as the cut proceeds so that it cuts the curve. Take care to keep both edges balanced. The decoration could be omitted entirely if preferred.

The back and bottom are now screwed together from beneath. When joints have been cut, the parts are cramped together. If they are to be nailed, lines should be drawn at the outside of the sides as a guide for the nails. The last named should have small heads, and they should be " dovetailed " to give a firm grip. Finally the whole thing is waxed.

CUTTING LIST

Design D

	Length.	Width.	Thickness.
2 Sides . . .	$8\frac{1}{4}$ in.	$6\frac{1}{8}$ in.	$\frac{1}{2}$ in.
1 Back . . .	$13\frac{3}{4}$,,	$5\frac{1}{8}$,,	$\frac{3}{8}$,,
1 Bottom . .	$13\frac{3}{4}$,,	4 ,,	$\frac{3}{8}$,,

The above sizes allow for joints.

Boxes

Under this heading are included the many smaller types of boxes such as those for cards, cigarettes, gloves, and so on. Those shown in Fig. 169 are intended mainly as suggestions. The sizes could be varied to meet individual requirements, the chief point to remember being that the inner dimensions must be calculated to suit the purpose for which the box is intended. The corner joints can be of the simple mitred type with strengthening slips of veneer let in dovetail fashion (see *C*, Fig. 97, page 90, Chapter II, or they can be dovetailed, or the simple lapped joint at *A*, Fig. 169, can be used. The dovetailed joint is the strongest, and can be regarded as a decorative feature, but is not really suitable for a veneered box, because of the liability of the joints to show through the veneer in the event of shrinkage.

CARD BOX A

Taking the first box at *A*, Fig. 169, this could be made in any solid hardwood, and is suitable for cards or cigarettes. If intended for the latter, it could be about $3\frac{1}{8}$ in. wide inside by $5\frac{1}{2}$ in. long with a depth of 2 in. For two packs of cards it could have inner dimensions of 6 in. long by 4 in. wide by $1\frac{1}{2}$ in. deep. In this case pieces of ribbon should be glued to the bottom so that the packs can be easily raised. In all cases the box should be made in one, complete with the lid, the latter being sawn away after glueing up.

First cut out the wood for the sides and ends from $\frac{3}{8}$-in. stuff, planing them in pairs to exactly the same size. Note that the long sides run to the full length, whereas the ends are short by the amount of lap left at the joints. This might be about $\frac{1}{8}$ in. Fig. 170 shows the sizes to which to work, though they could be varied if

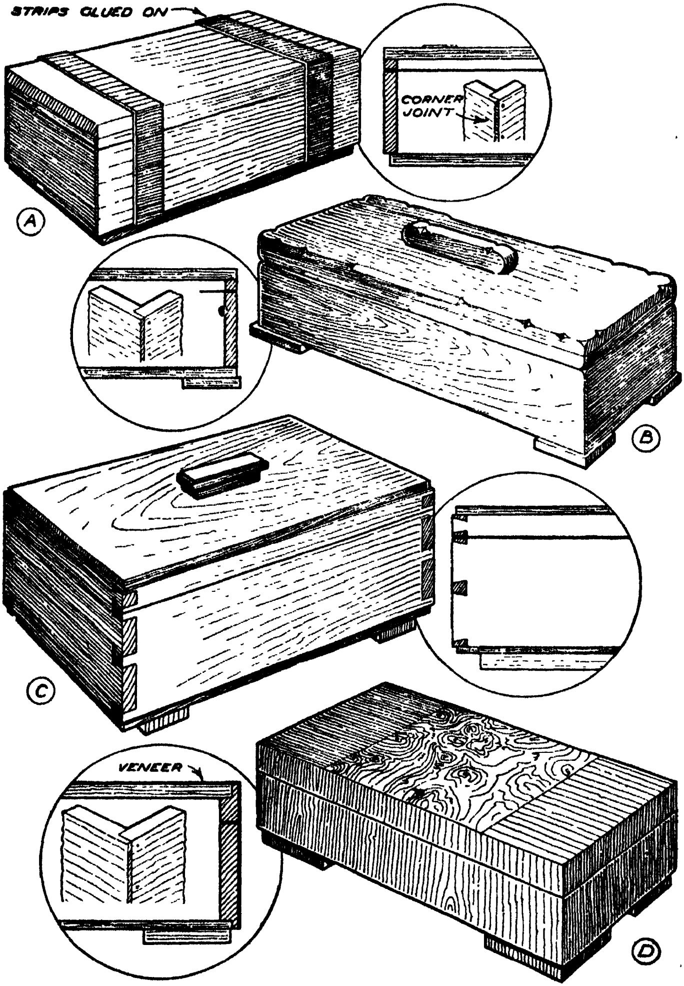


FIG. 169.—SIMPLE BOXES FOR CIGARETTES, CARDS, GLOVES, ETC.

The sizes can be varied to suit individual requirements. Remember that it is the inside sizes that count.

desired. At the ends of the long sides the rebates forming the lapped joints are cut. They are marked out with the cutting-gauge. To cut them saw across the grain up to the gauge-line, and chop *with* the grain with a chisel

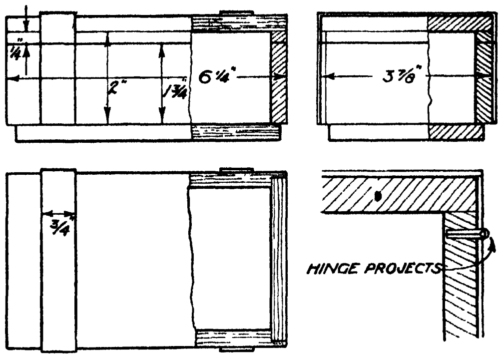


FIG. 170.—MAIN SIZES AND DETAILS OF BOX *A*.

nearly down to the line. They are finished off by careful paring with the chisel.

Before putting together the parts, the line where the lid is to be sawn away should be marked, because it is

CUTTING LIST FOR BOX *A*

	Length.	Width.	Thickness.
2 Sides . . .	$6\frac{3}{8}$ in.	$2\frac{1}{4}$ in.	$\frac{5}{8}$ in.
2 Ends . . .	$3\frac{7}{8}$,,	$2\frac{1}{4}$,,	$\frac{3}{8}$,,
1 Top . . .	$6\frac{3}{8}$,,	4 ,,	$\frac{3}{8}$,,
1 Bottom . .	$6\frac{1}{8}$,,	$3\frac{3}{4}$,,	$\frac{3}{8}$,,
2 Bandings . .	$\frac{7}{8}$,,	$4\frac{1}{4}$,,	$\frac{1}{16}$,,
4 ,, . .	$\frac{7}{8}$,,	$2\frac{5}{8}$,,	$\frac{1}{16}$,,
1 pair $\frac{3}{4}$ in. brass butt hinges.			

important that no nails are driven in at this point. Glue the joints and drive in fine nails, punching them in afterwards. After levelling the edges, the top and bottom are glued on, the latter being also nailed. The top can pro-

ject a trifle all round to allow for levelling afterwards, but the bottom stands in as shown in Fig. 170.

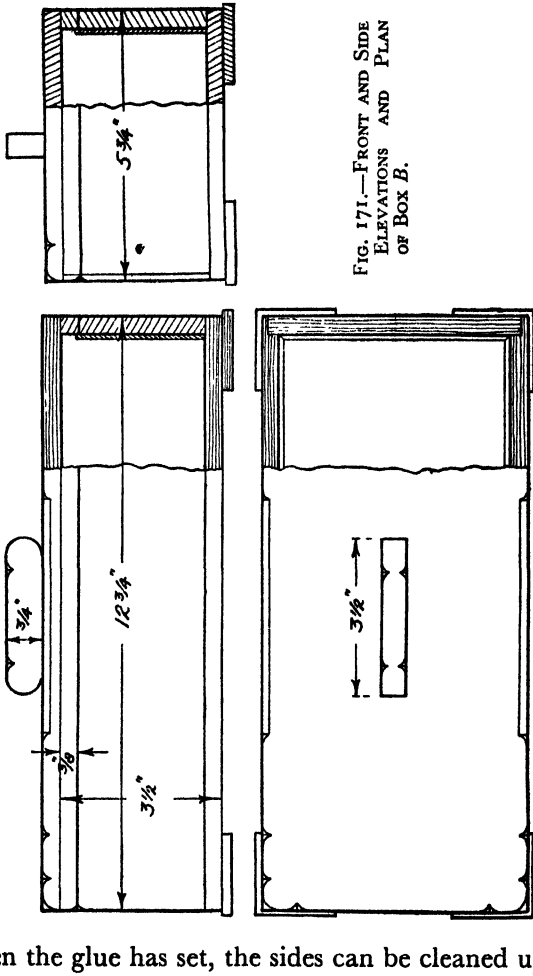


FIG. 171.—FRONT AND SIDE ELEVATIONS AND PLAN OF BOX *B*.

When the glue has set, the sides can be cleaned up and the banding put on. These can be strips of thick veneer

or of $\frac{1}{16}$-in. wood cut across the grain. They are glued down and a flat piece of wood is cramped down on top. If no cramps are available, a heavy weight can be placed on top. When the glue has set sufficiently to hold the strips (say a couple of hours), the cramps can be removed and the glue at the edges scraped away.

The lid is next sawn away as in Fig. 174. Start at one corner as shown and work gradually round. After cleaning up the edges, the hinges can be fitted, half into the box and half into the lid. Note that the knuckle of the hinges must project out level with the bandings (Fig. 170), otherwise the lid will bind.

GLOVE BOX B

The box at *B*, Fig. 169, is suitable for gloves or for any purpose requiring larger space. It is suitable for making in oak, and would look well polished with wax. The construction is similar to that already given, though the corners could be dovetailed if preferred. It has a loose lid, and this necessitates a lining being fitted.

Proceed in the way already described, cutting the parts to the sizes given in Fig. 171, and rebating the ends. When the sides are together and the edges levelled, the top and bottom are glued on, both being made to overhang slightly, to allow for trimming. They are glued

CUTTING LIST FOR BOX *B*

	Length.	Width.	Thickness.
2 Sides . . .	13 in.	$3\frac{1}{4}$ in.	$\frac{3}{8}$ in.
2 Ends . . .	$5\frac{3}{4}$,,	$3\frac{1}{4}$,,	$\frac{3}{8}$,,
1 Top . . .	13 ,,	$5\frac{7}{8}$,,	$\frac{3}{8}$,,
1 Bottom . .	13 ,,	$5\frac{7}{8}$,,	$\frac{3}{8}$,,
1 Handle . .	$3\frac{3}{4}$,,	$\frac{7}{8}$,,	$\frac{1}{2}$,,
4 Feet . . .	$1\frac{7}{8}$,,	$1\frac{7}{8}$,,	$\frac{1}{4}$,,
2 Linings . .	$12\frac{1}{4}$,,	3 ,,	$\frac{1}{8}$,,
2 ,, . .	$5\frac{1}{4}$,,	3 ,,	$\frac{1}{8}$,,

only, no nails being necessary. It is immaterial whether the decoration at the edges is done before or after separating the lid. It can be done entirely with the chisel. After marking out, the blade of the chisel is held at 45 degrees across the edge and is tapped sharply inwards. The wood at each side is then eased away towards the cut. It is better to make as few cuts as possible. In the case of the centre chamfer, the ends are cut in first and the waste is pared away up to the pencil line.

After sawing apart, the handle can be screwed on from underneath. The feet are fixed with two or three nails and glue, or they can be screwed. For the lining either $\frac{1}{8}$-in. or $\frac{1}{16}$-in. wood is used. It is rounded at the top edges and allowed to stand up a trifle so that the lid fits over it. The corners are mitred. Fig. 175 shows how the lining fits.

DOVETAILED BOX C

Oak is the most suitable wood for this box. The general procedure is the same as before, but all four sides must be made to the overall size. The method of dovetailing has already been explained on page 83, Chapter II. One point to note, however, is that a small dove-

CUTTING LIST FOR BOX C

	Length.	Width.	Thickness.
2 Sides . . .	$9\frac{1}{4}$ in.	$3\frac{5}{8}$ in.	$\frac{3}{8}$ in.
2 Ends . . .	$5\frac{1}{4}$,,	$3\frac{5}{8}$,,	$\frac{3}{8}$,,
1 Top . .	9 ,,	5 ,,	$\frac{1}{4}$,,
1 Bottom . .	9 ,,	5 ,,	$\frac{1}{8}$,,
2 Feet . . .	$4\frac{3}{4}$,,	$1\frac{3}{8}$,,	$\frac{3}{8}$,,
1 Handle . .	$2\frac{3}{4}$,,	1 ,,	$\frac{1}{4}$,,
1 ,, . .	$2\frac{1}{4}$,,	$\frac{1}{2}$,,	$\frac{1}{4}$,,
2 Linings . .	$8\frac{1}{2}$,,	$3\frac{1}{8}$,,	$\frac{1}{8}$,,
2 ,, . .	$4\frac{1}{2}$,,	$3\frac{1}{8}$,,	$\frac{1}{8}$,,

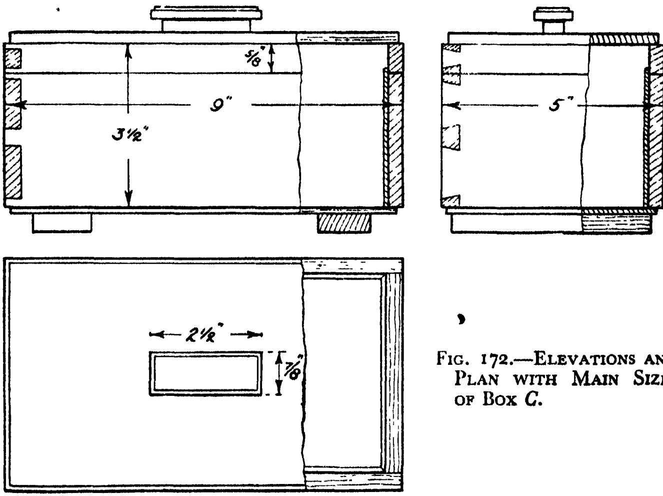


FIG. 172.—ELEVATIONS AND PLAN WITH MAIN SIZES OF BOX *C*.

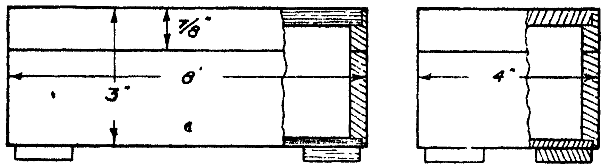
tail must be allowed at the top, so that it is included in the lid when the latter is cut away (Fig. 174). Both top and bottom stand in all round, and they should be cut to the finished size before being glued down. The feet are glued and pinned from the inside.

Two separate pieces are used for the handle. The top one has a neat rebate worked all round, though for a simpler job a plain chamfer could be worked. The two pieces are glued together and screwed on from inside. A lining is needed, and this is fitted as explained for box *B*.

VENEERED BOX D

Various combinations of veneers could be used for this. Straight-grained walnut with a top panel of burr walnut, or mahogany and amboyna, are two examples Mahogany is the best groundwork to use, or American whitewood. The corner joints are of the lapped kind already described, and, in addition, the top and bottom fit in rebates as in

Fig. 173. After cutting the joints, the edges are rebated, the rebate being made of the same width as those of the joints. After glueing up, the joints are levelled and the surfaces toothed or roughened with glasspaper wrapped round a flat block. All nail-holes are filled in with a mixture of glue and plaster of Paris.



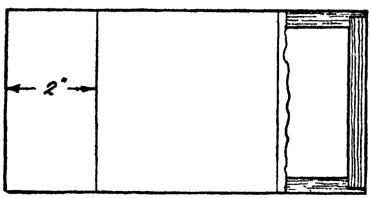


FIG. 173.—ELEVATIONS AND PLAN OF BOX *D* WITH MAIN SIZES.

CUTTING LIST FOR BOX *D*

	Length.	Width.	Thickness.
2 Sides . . .	$8\frac{1}{4}$ in.	$3\frac{1}{8}$ in.	$\frac{3}{8}$ in.
2 Ends . . .	$4\frac{1}{4}$,,	$3\frac{1}{8}$,,	$\frac{3}{8}$,,
1 Top . . .	8 ,,	4 ,,	$\frac{3}{8}$,,
1 Bottom . .	8 ,,	4 ,,	$\frac{3}{16}$,,
4 Feet . . .	$1\frac{3}{8}$,,	$1\frac{3}{8}$,,	$\frac{1}{4}$,,

1 pair $\frac{3}{4}$-in. brass butt hinges.
Veneer extra.

The process of veneering is explained on page 129, Chapter III. First veneer the two opposite sides with the hammer and trim off the overhang at the ends. This enables the ends to be veneered straightway. When the glue has set, the top is dealt with. The centre part is laid first, and the ends are cut straight with chisel and straight-edge. The plain ends are then easily fitted up

and laid, the joints being covered with gummed tape. If the centre veneer is inclined to buckle, the three pieces can be fitted together dry, and then laid as a whole with a caul. In this case a couple of fine veneer pins must be driven in to prevent the veneer from shifting.

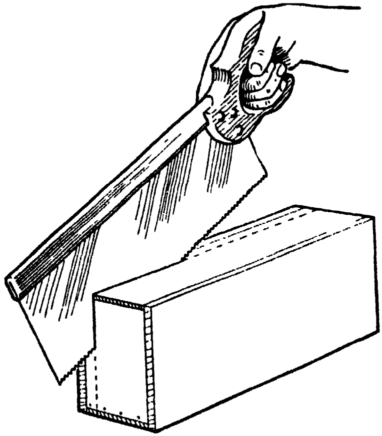


FIG. 174.—SEPARATING BOX LID.
The nails must be driven in so that the saw clears the nails.

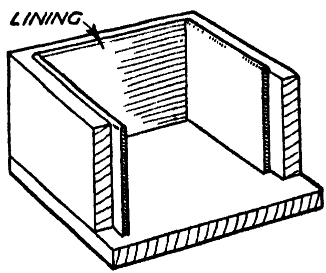


FIG. 175.—BOX LINING.
If a tight fit is made no fixing is necessary.

Remember to put a sheet of paper between the veneer and the caul. The whole thing is cleaned up later with the scraper.

TRAYS

Wooden trays are one of the simplest things to make, and by a little ingenuity they can be made most attractive without adding to the difficulty of construction. For the base either solid wood or plywood can be used. The latter has the advantage of being stronger across the grain and being free from shrinkage. On the other hand, the layers show at the edges, and this makes it

desirable to fit a rebated or grooved edging so that these are hidden. Various ready-made mouldings can be obtained—those, for instance, shown at *B*, Fig. 177—but they have now become somewhat out of date. The corners are mitred together and the panel is screwed on beneath.

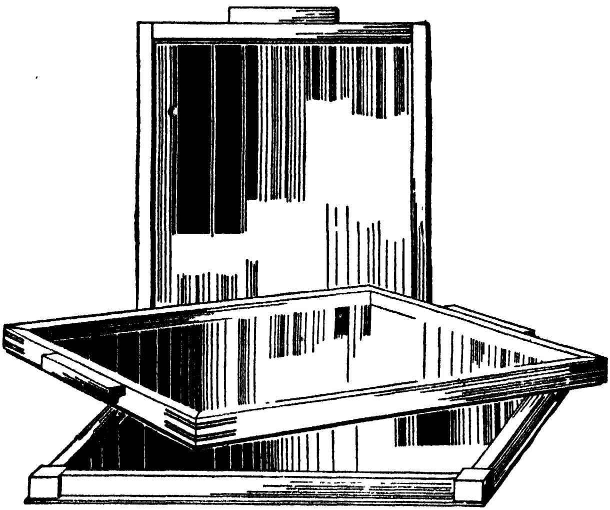


FIG. 176.—MODERN TRAYS WITH SQUARE EDGINGS.

An altogether more attractive suggestion is that at *A*, Fig. 177. In this the edging is made up of three strips of wood glued together. Assuming the edging to be $\frac{7}{8}$ in. high, three pieces of $\frac{5}{16}$-in. or $\frac{1}{4}$-in. wood are planed up and glued together. The two outer pieces might be of oak and the inner one of walnut, though many other combinations are possible. They should be pressed tightly together with thumb-screws. When set, the edges are trimmed and a wide bevel is worked down as far as the inner piece, as shown at *A*, Fig. 177. In this way an

attractive inlaid effect is produced. Care must be taken to make the bevels of the same angle and depth in all four pieces.

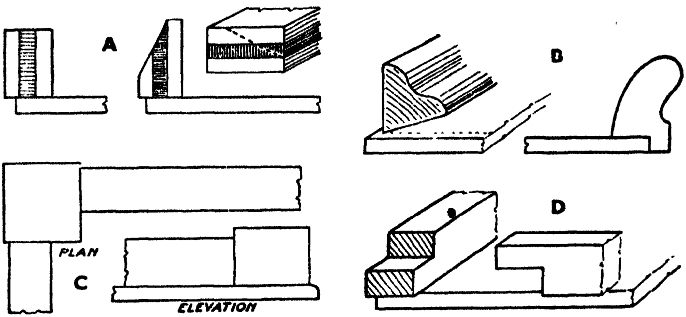


FIG. 177.—VARIOUS FORMS OF TRAY EDGINGS.

A. Inlaid effect produced by jointing up and bevelling.
B. Ready-made mouldings for edgings.
C. Use of corner blocks to avoid mitreing.
D. Simple halved joint for corners.

The corners are mitred together, the opposite members being of exactly the same length. The joints are cut on

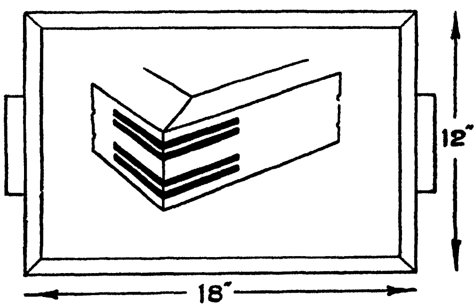


FIG. 178.—CORNERS STRENGTHENED WITH KEYS.
These give an inlaid effect.

the mitre block. When putting them together, the joints are glued and the pieces placed in position on a

flat board. A piece of string is passed round the whole and tied tightly. By inserting little blocks of wood between the string and the wood and pushing them towards the corners, the joints are pressed tightly together. When dry, the bottom edges can be levelled if necessary. Either solid wood or veneered plywood can be used for the panel. The former is the better if quite seasoned. It may be necessary to joint together two or more pieces.

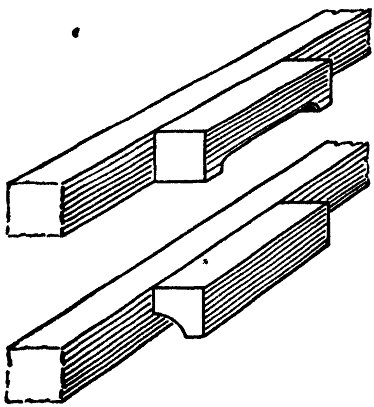


Fig. 179.—Simple Wood Handles.

The panel stands in all round and is screwed to the edging from beneath. The handles could be blocks of wood cut to one of the shapes suggested in Fig. 179. They are glued and held with a couple of screws driven through the edging. It is advisable to polish the panel before fixing it.

If it is desired to avoid mitreing, the simple method given at *C*, Fig. 177, can be followed. At the corners are fixed blocks of wood, and the edging is butted between these. All the parts are screwed on from beneath. The

top edge of the edging could be rounded, or a couple of inlay strings could be let in to take off the plainness. Another suggestion for the corners is the halved joint at *D*, Fig. 177.

Another attractive tray is given in Fig. 178. The edging is about $\frac{7}{8}$ in. high by $\frac{1}{2}$ in. wide, and the corners are mitred. After it has been glued up, a series of four saw-cuts is made diagonally, and slips of dark veneer or

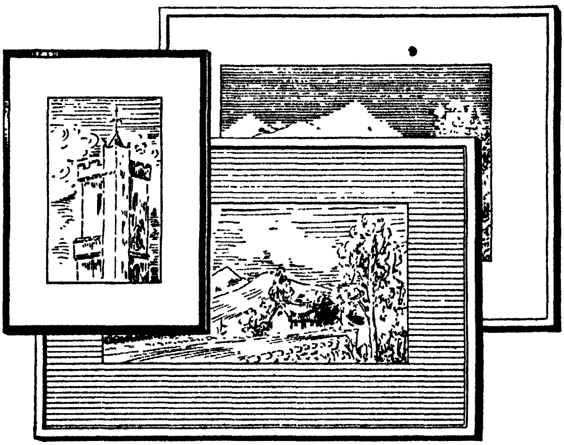


Fig. 180.—Picture-Framing is Interesting Work.
The materials are quite inexpensive.

thin wood are glued in. Care must be taken to make all the cuts of equal depth and to avoid allowing the saw to emerge at the inner corner. These slips not only give an enriching touch, but they also strengthen the joints. The panel could stand in a trifle and be screwed on beneath.

Picture-Framing

Not many tools are needed for this work. A back-saw with fine teeth and a mitre block on which to cut

the mitres are the chief requirements. The plane to trim mitres which are somewhat full is an advantage, though if care is taken the joints can be sawn to the correct length straightway. A hammer and punch are necessary when putting the parts together. Special mitre cramps can be obtained, but these are not essential.

For the most part specially made mouldings are used, these having a rebate at the back in which the picture, glass, and backing fit. They can be obtained in long lengths, and require simply to be cut up. The only possible complication is in the case of mouldings having a carved decoration, in which case the decoration has to be matched at the corners. A section through a moulding is shown in Fig. 181.

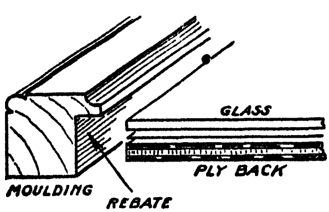


FIG. 181.—SECTION THROUGH FRAME.

The important part in making a frame is in calculating the size. It is simple enough to measure the picture and say the rebate size is to be a trifle larger. The trouble is that when the mitres are being cut the rebate cannot be seen, so that it is necessary to work to the over-all size of the frame. It will be realised that the *outer* edge of the moulding bears against the mitre block, and it is only here that the exact position in which the saw will cut can be seen.

As an example, assume that a picture 12 in. by 8 in. is to be framed as in Fig. 182. The first step is to measure the moulding beneath the rebate, in this case $\frac{3}{4}$ in. as shown. To obtain the over-all size, double this measurement has to be added to the picture size, plus, say, $\frac{1}{8}$ in. for clearance. This gives sizes of $13\frac{5}{8}$ in. and $9\frac{5}{8}$ in. First cut a mitre at one end of the moulding, and measure

along it from the point a length of $15\frac{5}{8}$ in. Placing the moulding on the mitre block with the pencil line just to

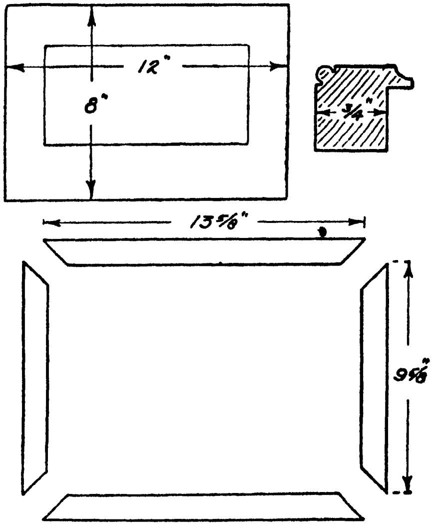


FIG. 182.—HOW SIZE OF FRAME IS CALCULATED.

one side of the saw kerf, cut the other mitre. It can be trimmed if desired on the mitre shooting-board, but this is not necessary if the work is carefully done. Take the size of the opposite moulding from it. The shorter sides are cut in the same way.

The parts should be tried together on a flat panel of wood. See that the mitres make a close joint and that the frame is not in winding. To

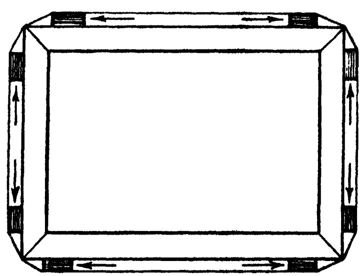


FIG. 183.—TIGHTENING JOINTS.
The blocks are pushed towards the

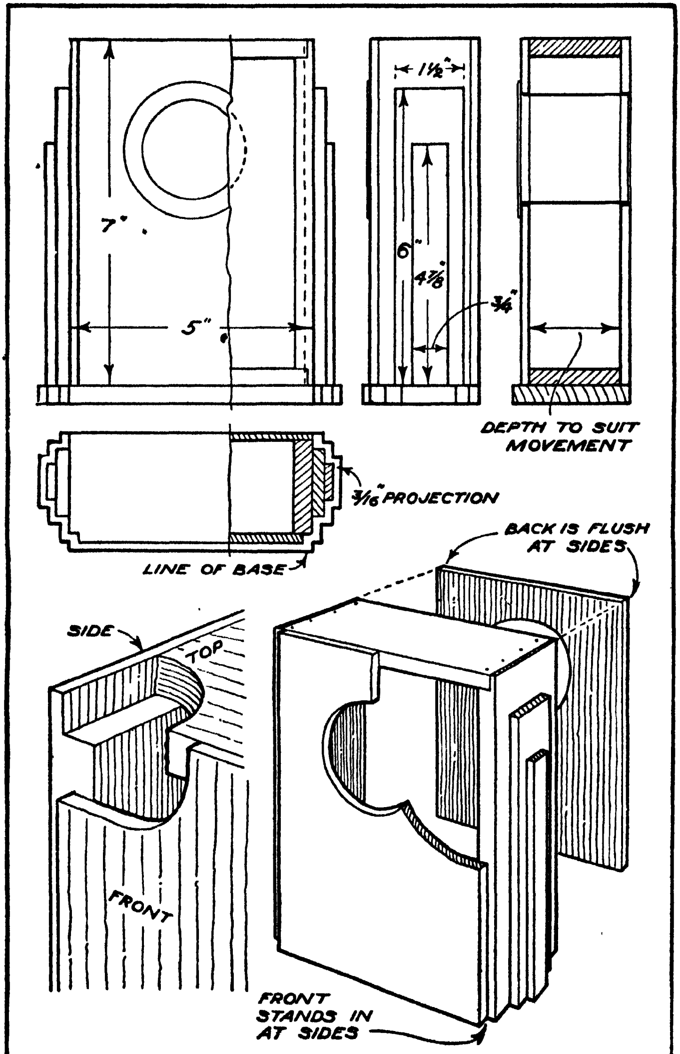


FIG. 186.—HOW CLOCK WITH DRUM MOVEMENT IS MADE.

full height above the base. The top and bottom are short of the width by the thickness of the lap at each side.

CUTTING LIST

	Length.	Width.	Thickness.
2 Sides . . .	$7\frac{1}{4}$ in.	2 in.	$\frac{3}{8}$ in.
1 Top . . .	5 ,,	2 ,,	$\frac{3}{8}$,,
1 Bottom . .	5 ,,	2 ,,	$\frac{3}{8}$,,
1 Base . . .	$6\frac{1}{2}$,,	$2\frac{5}{8}$,,	$\frac{3}{8}$,,
1 Front . . .	$7\frac{1}{4}$,,	$4\frac{7}{8}$,,	$\frac{3}{16}$,,
1 Back . . .	$7\frac{1}{4}$,,	$5\frac{1}{8}$,,	$\frac{3}{16}$,,
2 Buttresses . .	$6\frac{1}{4}$,,	$1\frac{5}{8}$,,	$\frac{1}{4}$,,
2 ,, . .	5 ,,	$\frac{7}{8}$,,	$\frac{1}{8}$,,

Drum movement $2\frac{1}{4}$ in. drum diameter and $2\frac{1}{4}$ in. depth. If measurements of this vary the above sizes must be altered accordingly.

This can be $\frac{1}{8}$ in. They will thus measure $4\frac{3}{4}$ in. long. Mark the joints with the gauge, and cut by sawing across

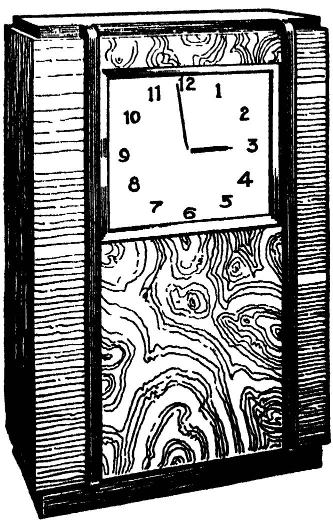


FIG. 187.—VENEERED CLOCK CASE.
Fitted with square dial.

the grain and chiselling away the waste. Put the parts together with glue and nails, punch in the last named, and level the joints after the glue has set.

The back is made to fit flush all round, and a hole is cut in it to take the drum. Glue and fine nails are used for fixing. As shown in Fig. 186, the sides of the front stand in to give the stepped effect. It is veneered before fixing. It is better to joint the veneer dry and stick a piece of gummed tape over it. It can then be laid with a caul (see section on Veneering). The hole for the drum is cut afterwards. Glue alone can be used for fixing. A flat board should be placed over it and the cramps tightened over this. To prevent it from shifting, a few nails can be driven in at the back with the heads projecting so that they bear against the inner sides of the case. If cramps are not available, a heavy weight can be placed over the front.

The buttress pieces at the sides follow. They are cut to the sizes given in Fig. 186 and are glued on. One or two fine nails can also be used if desired. The simplest way of obtaining the shape of the base is to cut it square to the over-all size and place it in position. A pencil is then drawn around, and the necessary overlap marked out from the pencil lines. It is screwed on from beneath, but should not be fixed finally until after the case has been polished. The movement (also fixed after polishing) is held with fine screws or nails driven through the flange.

CLOCK CASE WITH SQUARE DIAL

Here, as in the previous example, the case in Fig. 187 owes a great deal of its effect to the use of veneer, but if simplicity is essential it could be made in hardwood throughout. Walnut is recommended for the veneer, a burr being used for the centre part and plain walnut cross-grained for the flanks. Fig. 188 gives the main sizes

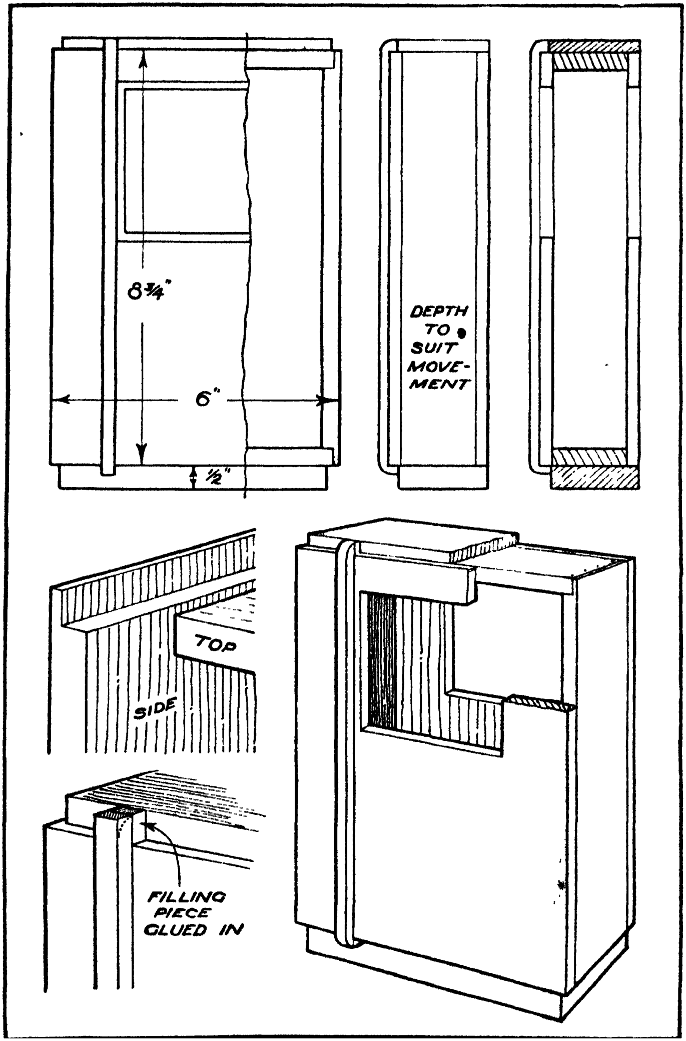


FIG. 188.—MAIN SIZES AND CONSTRUCTION DETAILS FOR CASE WITH SQUARE DIAL.

and shows how the case is made. It is very similar to the previous case, the top and bottom being joined to the sides with lapped joints. As before, there is usually a drum behind the square dial, and holes for this are cut in front and back.

CUTTING LIST.
(FIG. 188)

	Length.	Width.	Thickness.
2 Sides . . .	9 in.	1⅝ in.	⅜ in.
1 Top . . .	6 ,,	1⅝ ,,	⅜ ,,
1 Bottom . .	6 ,,	1⅝ ,,	⅜ ,,
1 Top . . .	6 ,,	2⅛ ,,	¼ ,,
1 Bottom . .	6 ,,	2 ,,	½ ,,
1 Front . . .	9 ,,	6⅛ ,,	¼ ,,
1 Back . . .	9 ,,	6⅛ ,,	¼ ,,
2 Uprights . .	9½ ,,	¼ ,,	$\frac{3}{16}$,,
1 Movement. Barrel 3¼ in. diameter, 2⅛ in. deep. If sizes of movement vary, the cutting list must be altered accordingly.			

There is no need to repeat all the instructions. The sides are joined to the top and bottom and the back is added. In this case, however, the front is made to fit flush and can be veneered after being fixed, though this is not essential. The veneer should be jointed up dry and be laid with a caul.

After cleaning up, the top and bottom are added, both standing in at front and sides. The upright strips are made as shown in Fig. 188. They extend across the top and bottom and little filling pieces are glued in. They are rounded over at the ends after the glue has set. The whole thing can be either wax or french polished.

LADY'S WORK-TABLE

A work-table of handy size is given in Fig. 189. It stands 24 in. high, suitable for the chair side, and is 18 in. long by 11 in. wide. The box portion is 9 in. deep, and a

sliding tray for cotton reels and general oddments is fitted inside. The top opens in two portions, and these form handy extensions when opened. The main frame-

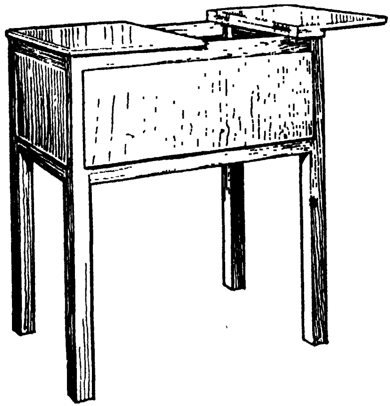


FIG. 189.—LADY'S WORK-TABLE.
With hinged lids and sliding tray.

work is put together with mortise and tenon joints of the simplest kind, and the panels are fixed on at the outside, thus obviating the necessity of grooving the rails and legs.

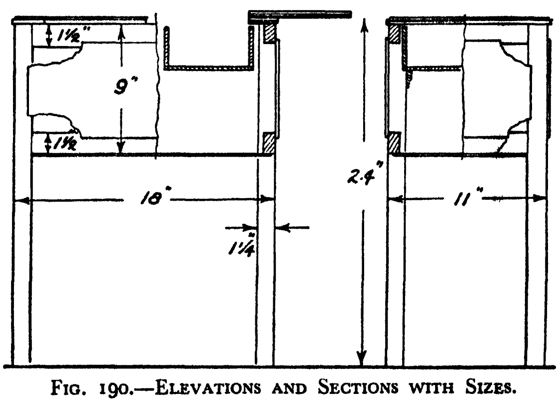


FIG. 190.—ELEVATIONS AND SECTIONS WITH SIZES.

Prepare the four legs first. Squares 1¼ in. in section can be obtained ready made. They should be allowed about ½ in. full at the top, so that the wood is not liable to split when the mortises are cut. They are cut off after assembling. Fix all four together temporarily with a cramp, and square across them the positions of the mortises. Remember that the tenons of the rails have to be cut down at the top edges as shown at *A*, Fig. 191, and corresponding marks must be squared across at the

CUTTING LIST

	Length.	Width.	Thickness.
4 Legs . . .	24½ in.	1¼ in.	1¼ in.
4 Rails . . .	17½ "	1⅝ "	⅞ "
4 " . . .	10½ "	1⅝ "	⅞ "
2 Panels . .	17½ "	7 "	3/16 in. ply
2 " . .	10½ "	7 "	3/16 "
1 Bottom . .	18 "	11 "	3/16 "
1 Top . . .	19 "	11⅛ " (To be cut up)	½ in.
2 Lippings . .	20 "	½ "	3/16 "
2 " . . .	13 "	½ "	3/16 "
2 Runners . .	18 "	¾ "	½ "
Tray :			
2 Sides . . .	9½ "	3¼ "	¼ "
2 " . . .	6½ "	3⅛ "	¼ "
1 Bottom . .	9½ "	6½ "	3/16 in. ply

mortises. The legs are then separated and the marks squared round on to the adjacent faces. Notes on chopping the mortises are given in a previous section. The sides are gauged in with the mortise gauge or with the marking-gauge set twice. Much of the waste can be bored away before chopping with the chisel.

The rails are marked out similarly, being fixed together in two sets of four each. Cut in the shoulder positions with the chisel, and square them round on to all four sides after separating. The sides are gauged in, and cut

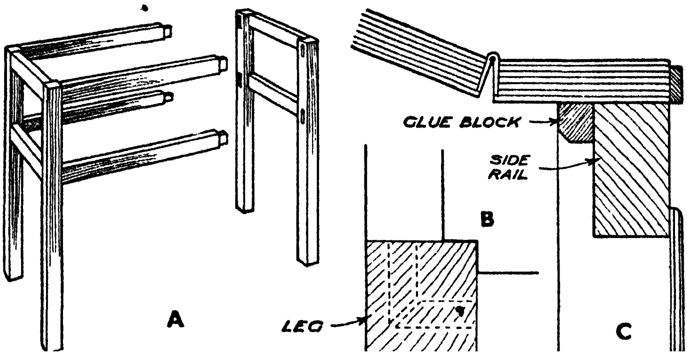


FIG. 191.—CONSTRUCTION DETAILS.
A. How main framework is made.
B. Section through leg showing tenons.
C. Method of hingeing lids.

with the saw. Each joint can then be fitted individually and a mark put on each so that it can be replaced. When assembling, glue up the two opposite sides independently and allow the glue to set before adding the remaining rails. In this way the glued-up sides can be regarded as complete units. It saves having to deal with many

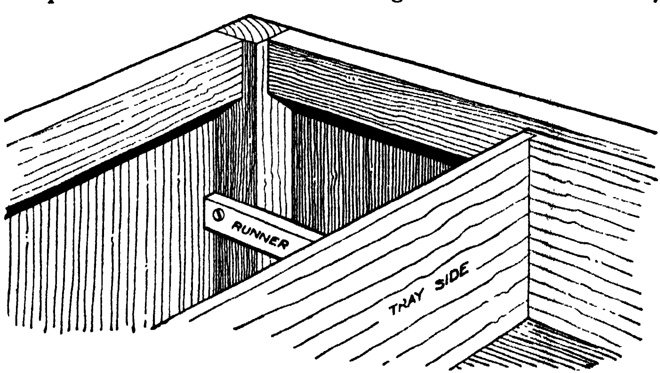


FIG. 192.—INSIDE OF TABLE, SHOWING TRAY.

joints in one operation. *C*, Fig. 191, shows how the top is arranged. The fixed end-pieces can be screwed up through the rails, and glue blocks rubbed in beneath for additional strength. The lids are hinged to these fixed pieces. Note that an edging is fixed all round. This hides the layers of the plywood and gives an easy means of raising the lids.

Plywood $\frac{3}{16}$ in. thick is used for the side panels. The edges are rounded over, and they are fixed with glue and fine pins, the last-named being punched in and the holes filled with plastic wood. The bottom is also of plywood, and is screwed beneath the rails. It stands in about $\frac{1}{4}$ in. all round, and the corners are cut to fit round the legs.

Fig. 192 shows how the tray is made with simple lapped joints glued and nailed together. The bottom is pinned beneath. The tray rests upon runners screwed to the legs as shown. If necessary a little candle-grease can be rubbed on the bearing parts, but this should be done after staining.

CHAPTER V

THE HALL

Oak Stool with Hinged Lid

This makes an extremely attractive piece for the hall. It is in the Tudor Gothic style, and is designed specially for simplicity of construction. A useful box portion is arranged beneath the lid, and this should prove handy for oddments.

First prepare the two trestle ends or legs from $\frac{7}{8}$-in. oak. They can be cut out first in the form of rectangles, 13¼ in. by 10 in. Having planed the edges square, the taper of the sides can be marked in so that the top is 8 in. wide. The shape of the bottom can also be marked by drawing in the 1-in. squares and plotting in the curves map fashion as at *B*, Fig. 193. The shaped lines can be cut in with the bow-saw or keyhole-saw (the former preferably), and be finished off with spokeshave and rasp. The straight sides can be sawn away and finished with the plane. To enable the front and back to be fitted in flush, the edges of the legs are cut in as shown at *B* and *C*. A depth of $\frac{7}{8}$ in. is cut in, this being the thickness of front and back.

Now proceed with the last-named, cutting them from $\frac{7}{8}$-in. oak to finish 14 in. by a trifle over 6 in. The ends slope inwards so that at the top they measure 13 in. In the first place, however, it is better to make the pieces square. When the edges are trimmed the simple gouge-cut decoration can be made at the ends.

As the parts are fixed together with screws, a series of screw-holes must be bored parallel with the sloping ends. The screws are recessed as at *D*, and the best

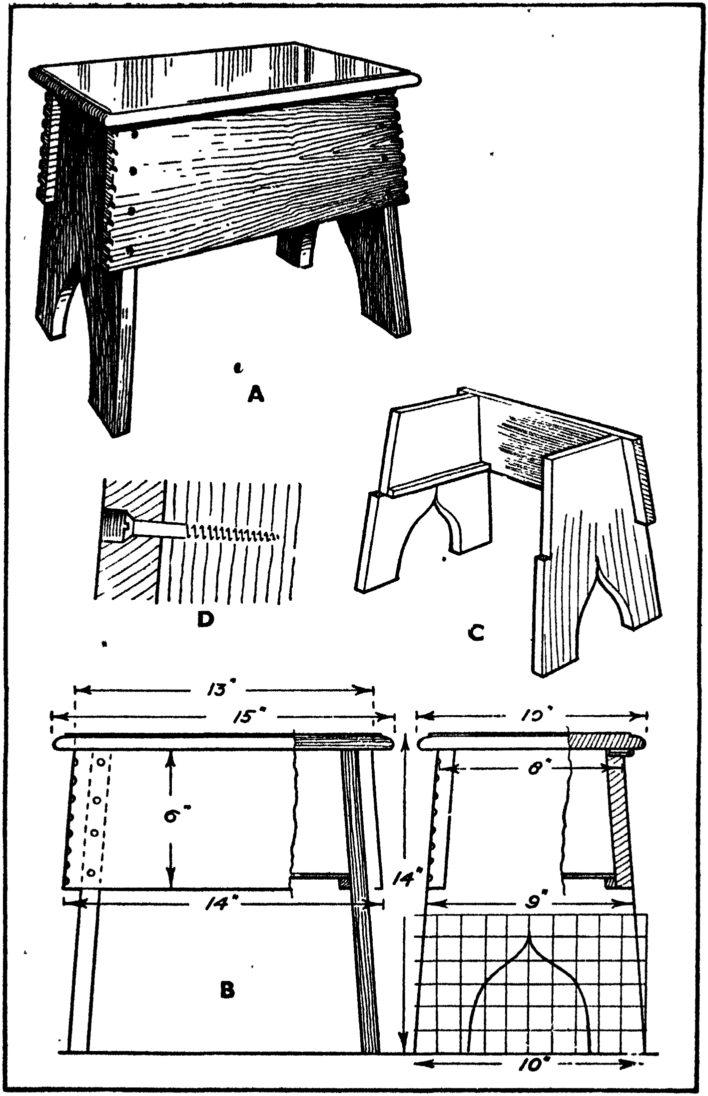


Fig. 193.

plan is first to bore holes large enough to take the screw-heads and passing in about one-third of the thickness. Holes for the shanks can then be bored.

The parts can now be tried together, and it will be found that the joints will be a trifle open at one side owing to the splay of the side and legs. This necessitates

CUTTING LIST

	Length.	Width.	Thickness.
2 Legs . . .	13½ in.	10⅛ in.	⅞ in.
2 Pieces . . . (front and back)	14¼ „	6¼* „	⅞ „
1 Top . . .	15¼ „	10⅛ „	⅝ „
1 Bottom . .	11½ „	7¾ „	¼ in. ply
2 Fillets . . .	11½ „	½ „	½ in.
2 „ . . .	7¾ „	½ „	½ „
1 Pair 2-in. butt hinges			
About 18-in. brass chain			

the edges of the notched portion of the legs being planed away at a slight angle. The amount is easily marked with a pencil when the parts are together in position. Afterwards the whole can be screwed together finally.

The top edges of al the parts will need to be planed to make them level. If left square they will necessarily slope inwards owing to the angle of the parts. This is easily done after they are together, since the plane, in resting on the adjacent side, is necessarily held at the required angle. The bottom ends of the legs must be planed similarly. For the bottom a piece of ¼-in. ply-wood can be used. This is planed so that it can be entered from beneath and be recessed sufficiently for the ½-in. fillets to be fixed around as at *B* and *C*.

FIG. 193.—SIMPLE OAK STOOL WITH HINGED LID.

A. The completed stool. *B.* Front and side elevations.
C. How the parts fit together. *D.* Method of recessing the screws.

The lid is hinged. The moulded edge is an advantage, and is easily worked by making first a rebate level with the top square member. It can then be rounded over

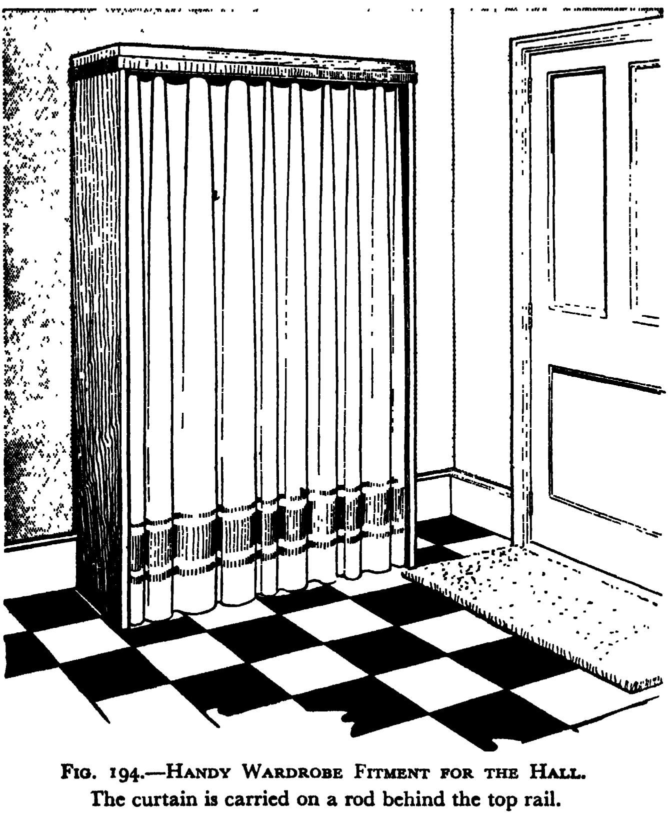


FIG. 194.—HANDY WARDROBE FITMENT FOR THE HALL.
The curtain is carried on a rod behind the top rail.

partly with the smoothing- and the rebate-planes. The end grain should be done first. Glasspaper held in a hollowed-out rubber will give a good finish. Alternatively the whole edge can be rounded over. Note that

the hinges are let in in their entirety into the back, and that the knuckle projects considerably. If this is done, the lid will open to a trifle more than a right angle, so that it will remain open. A pair of chains can be fitted to take the strain if it is knocked backwards. Finally the screw-holes can be filled in with little rounded pieces of oak. This is best done last, in case it should be necessary to withdraw the screws to make any adjustment. The whole thing can be stained and finished with wax.

Hall Fitment

A handy fitment in which coats and hats can be kept out of the dust in the hall is shown in Fig. 194. It is virtually a wardrobe, but by making it in fitment form a great deal of expense is avoided. It consists of two sides and a top with a frieze rail, and a pair of curtains. The whole thing is screwed to the wall wth screw plates. Behind the frieze rail a curtain runner is fitted, preferably of the type in which there are wheel runners in place of curtain hooks. This requires merely to be screwed in position. Hooks to hold coat hangers and for hats are screwed to the top and to the wall. For the latter it is a good plan

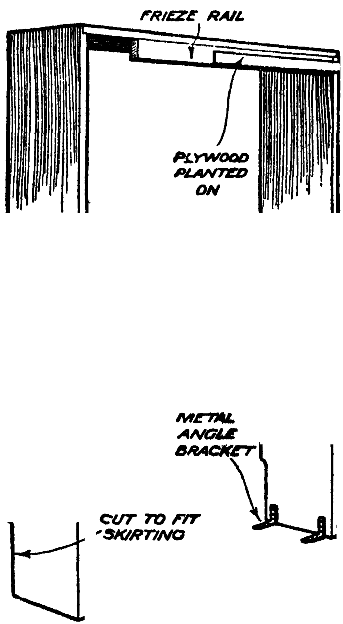


Fig. 195.—How the Hall Wardrobe is Made.

to fix a batten to the wall at a convenient height and screw the hooks to this.

Fig. 195 shows how the top is fixed to the sides by means of a simple lapped joint The parts are put together with glue and nails. The frieze rail is butted between the sides and is nailed in through the top. To the front of it,

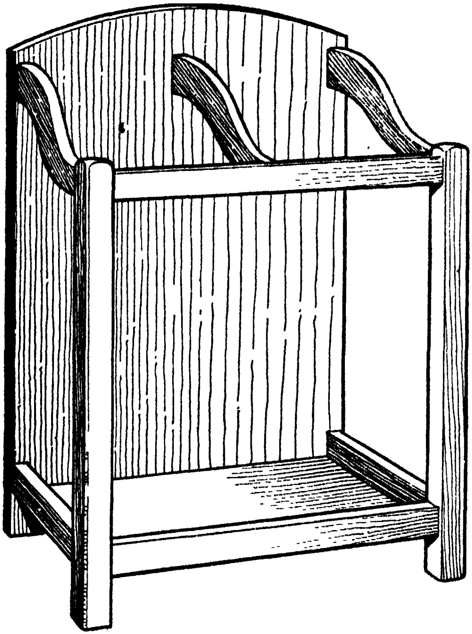


Fig. 196.—Hall-Stand in Oak or Similar Hardwood

and continuing around the sides, are strips of plywood, preferably with the grain running crosswise. These strips look very well if stained a darker shade than the rest of the woodwork. At the bottom the back edges are cut away to fit over the skirting. Angle brackets and screw plates are fixed on, and the whole thing is screwed in position.

Hall Stand

This is a necessity in every hall. The design shown in Fig. 196 is simple and gives all the accommodation likely to be needed. A tinplate drip pan can be made up to suit the size, or, if a ready-made one is available, the dimensions in Fig. 197 can be altered to take it. The structure

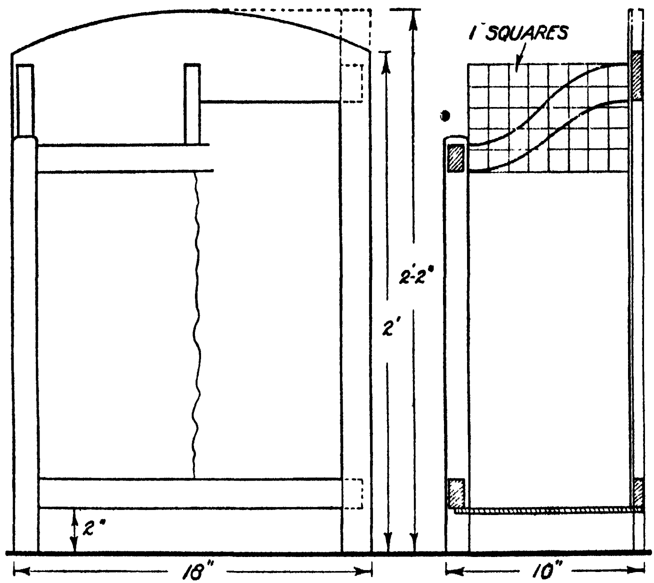


Fig. 197.—Front Elevation and Side Section.

consists of front and back frames joined by the side and centre rails. Mortise and tenon joints are used throughout.

Make up the back frame first. There are two uprights, a narrow bottom rail, and a wide top one, the latter wide enough for the curve to be worked in it. Prepare the uprights to size, and mark the mortise positions. Note that at the top the mortise is set well down, since the curve

at the top later cuts away much of the wood. This is made clear in Figs. 197 and 198. Glue up the frame, and, when the glue has set, level the joints. To the face glue a

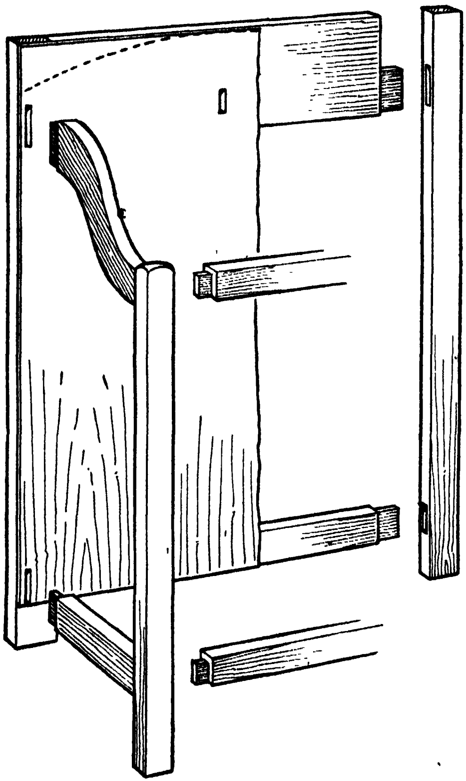


FIG. 198.—CONSTRUCTION DETAILS.

single sheet of plywood. If possible cramp it down; otherwise fine nails can be driven in, these being punched in. Be careful not to enter nails where the mortises for the side rails occur. Mark in the curve at the top. This

can be done by means of a strip of wood bent to coincide with marks previously pencilled in. Saw the shape and clean up with the spokeshave. Mark in the mortise positions, including that at the centre.

The front legs are squared to the finished size, and the mortises squared round. After they have been chopped, the front corners can be rounded. Fig. 198 shows the joints. To mark out the curved rails follow the 1-in. squares given in Fig. 197. A cardboard template can be prepared for marking on the wood. Take special care to make the shoulders square and parallel with each other. Remember to allow for the tenons. The centre rail will have to be slightly longer than the others because it meets the rail rather than the legs.

Front and back frames are assembled independently, and the side rails added after the glue has set. Finally a plywood bottom is screwed beneath the bottom rails.

CUTTING LIST

	Length.	Width.	Thickness.
2 Front legs . .	1 ft. 8½ in.	1¼ in.	1¼ in.
1 „ rail . .	1 „ 6 „	1¾ „	⅞ „
1 „ „ . .	1 „ 6 „	1½ „	⅞ „
2 Back legs . .	2 „ 2½ „	1¾ „	½ „
1 Rail . . .	1 „ 6 „	4¾ „	½ „
1 Rail . . .	1 „ 6 „	1¾ „	½ „
1 Panel . .	2 „ ½ „	18½ „	$\frac{3}{16}$ „
2 Side rails .	10 in.	1¾ „	⅞ „
3 Shaped rails .	10 „	5¼ „	⅞ „
1 Bottom . .	1 ft. 6 in.	10 „	¼ „

CHAPTER VI

THE STUDY

Electric Table Lamps

Fig. 199 is a good example of how an attractive table lamp can be made up in a simple way. Any hardwood can be used, though a fairly close-grained wood, such as American whitewood or satin walnut, is advisable. Parts are stained a darker shade than the rest, or, alternatively, a darker wood can be used. *B* and *C* give the main sizes, and *D* shows how the parts are fitted together.

Make the main upright first. It consists of two pieces, each with a $\frac{1}{4}$-in. groove along the centre of the inner

Cutting List

(Fig. 199)

	Length.	Width.	Thickness.
2 Posts . . .	11 in.	$1\frac{1}{8}$ in.	$\frac{1}{2}$ in.
4 Buttresses . .	$7\frac{1}{2}$,,	$\frac{5}{8}$,,	$\frac{3}{8}$,,
1 Cap . . .	$1\frac{3}{8}$,,	$1\frac{3}{8}$,,	$\frac{3}{16}$,,
1 Base . . .	$5\frac{1}{4}$,,	$5\frac{1}{8}$,,	$\frac{3}{4}$,,
4 Feet . . .	$1\frac{3}{8}$,,	$1\frac{1}{8}$,,	$\frac{1}{4}$,,
1 Electric holder with switch.			

side. These are glued together, the groove forming a channel through which the flex passes. Remember when cutting to length to allow for the tenon at the bottom which fits into the base.

If a plough or grooving plane is available, this should

Fig. 199.—Electric Table Lamp with Buttressed Sides.

A. Finished lamp. *B.* Side elevation.
C. Plan view. *D.* How parts fit together.
E. Detail of threaded barrelling for lamp-holder.

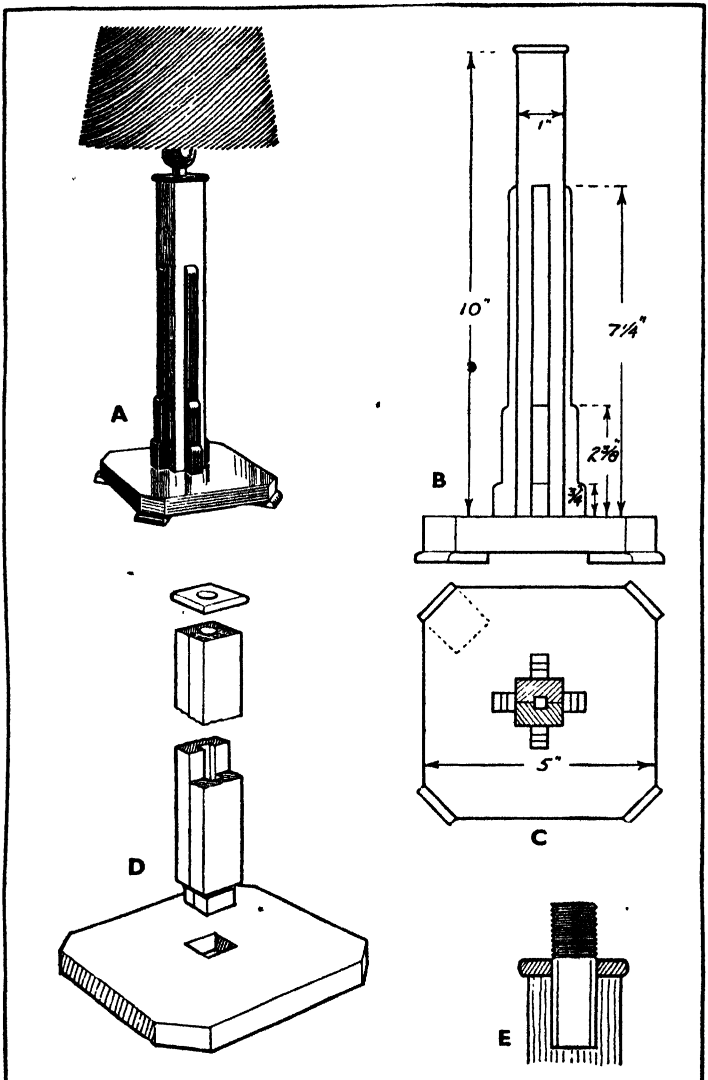


FIG. 199

be used to work the groove. Failing this, a scratch tool can be used (see page 62, Chapter I), the cutter being suitably filed. When completed, place a piece of oiled string in the groove and glue the two pieces together, using thumbscrews. By drawing the string back and forth, any glue which has squeezed out into the groove can be easily removed.

When the glue has set, plane the sides true and square round the shoulders of the bottom tenon. The top end can be cut off square. The tenon can suitably be ⅝ in. square, and it can pass right through the base. For the latter prepare a piece of ¾-in stuff, and mark out the ⅝-in. mortise in the centre. If a hole is bored right through first, it will simplify the chiselling. The corners can be taken off to the extent of 1 in., measuring diagonally. At this stage the upright can be glued in position.

The feet are plain blocks of ¼-in. wood with the outer ends rounded over. They are fixed with glue and a few fine nails. It is advisable to drill the holes first, to avoid splitting the wood. For the buttress pieces use strips of ⅜-in. wood. The shape can either be cut with the fret-saw or it can be partly sawn and partly chiselled. The pieces are fixed with glue and nails.

To enable the electric holder to be fixed, a piece of brass barrelling is let in at the top. It is threaded to take the holder, and is usually of ½ in. diameter. To bore the hole at the top, plug in the end of the groove temporarily so as to give a bearing for the bit. A corresponding hole is bored through the top capping. Alternatively a special screw fitting can be obtained. It should be noted that the dark parts should be stained

FIG. 200.—ALTERNATIVE DESIGN FOR TABLE LAMP.

A. Elevation with sizes. *B*. Plan of base. *C*. Section through upright. *D*. How upright is put together. *E*. Detail of lower end of upright.

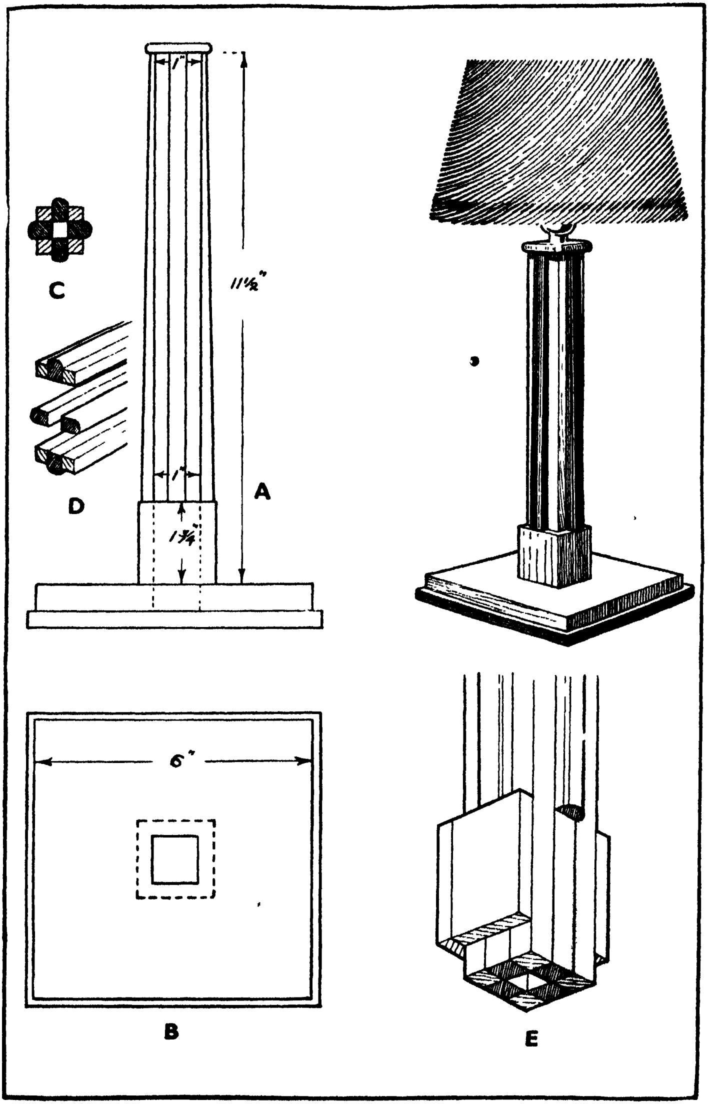


FIG. 200.

before being glued on. A holder embodying a switch should be used.

In some ways the lamp in Fig. 200 is simpler, in that no grooving is needed. The upright is made up of eight pieces glued together so that a centre space is left. The centre piece at each side is of a darker wood, and it projects to give a pillared effect. The sizes can be taken

CUTTING LIST

(FIG. 200)

	Length.	Width.	Thickness.
4 Upright pieces	12¼ in.	⅜ in.	⅜ in.
4 " "	12¼ "	¾ "	⅜ "
1 Cap . .	1½ "	1½ "	$\frac{3}{16}$ "
2 Plinth pieces	1⅞ "	1⅞ "	⅜ "
2 " "	1⅞ "	1⅛ "	⅜ "
1 Base . .	6¼ "	6⅛ "	½ "
1 " . .	6½ "	6⅜ "	⅜ "

Electric holder with switch.

from *A* and *B*, whilst the method of assembling is obvious from *C* and *D*.

For the corner pieces prepare four pieces of oak to finish 12 in. long by ⅜ in. bare in section. The four centre pieces are the same length, and are ⅜ in. bare in width. In depth, however, they taper from ⅝ in. at the bottom to a full ⅜ in. at the top. It will be found simpler to round over the edges before cutting out. They can be of walnut or other dark wood. Now glue up two opposite sides, each consisting of two square corner strips and one rounded piece as shown at *D*. When the glue has set, clean up the underside and glue between them the remaining centre pieces, thus completing the whole.

At the lower end the projecting centre pieces are cut away so that the square plinth parts can be glued on as at *E*. Note that the end projects beyond to form a tenon

to fit into the base. The latter is ½ in. thick, and at the centre a 1-in. square mortise is cut, though as a safeguard the actual tenon should be measured. After glueing up, a lower base ⅜ in. thick is added. A capping is prepared, and a hole bored both in this and in the top of the column to take the threaded barrel. The top can be plugged as before to enable the bit to be started. It is necessary to cut a channelling at the lower side of the upper base to enable the flex to pass out through the side. This is concealed when the lower base is screwed on. To give a neat finish the bottom can be covered with a piece of baize.

SECTIONAL BOOKCASE

The advantage of this type of bookcase is that you can add to it at any time, and shift the units about, either to make a change, or when it is necessary to move to another house. It takes slightly more timber than a single bookcase of equal capacity, but it is worth it in many ways. Bookcases of this sort vary somewhat in detail, but the chief difference lies in the doors. These can be either hinged, made to slide, or omitted altogether. In some respects the sliding type is the most satisfactory, and here we give the unframed glass type.

There are three main parts which are always wanted: the top, the bookcase carcase, and the plinth. To this basis any number of bookcase carcases can be added, and these can be made in varying sizes. Any number of stacks can be placed side by side, the sides being made flush throughout.

BOOKCASE CARCASE

Suggested sizes for this are given in Fig. 202, and construction details in Fig. 203. Prepare the ends, making

them perfectly square, and allowing in the depth for the rebate to hold the back. This might be $\frac{1}{4}$-in. ply. The

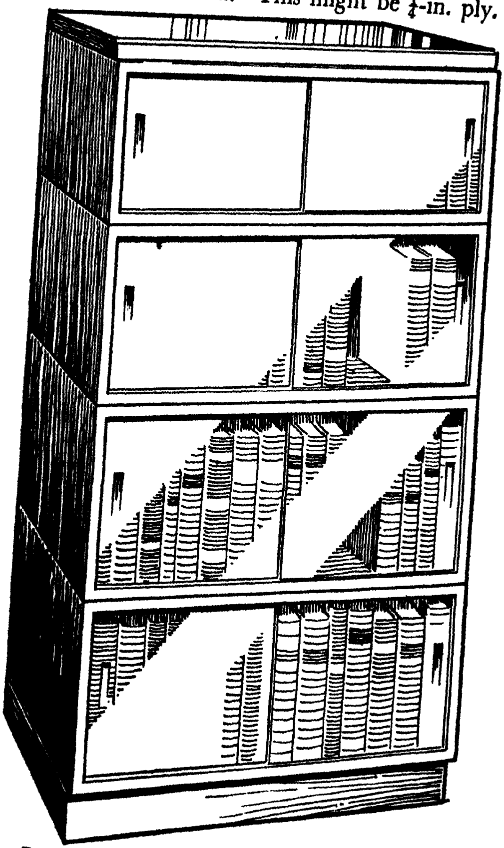


FIG. 201.—SECTIONAL BOOKCASE, WIDTH 2 FT. 6 INS.

bottom is lap-dovetailed to the ends. It extends only as far as the rebate at the back, and at the front a groove is

needed to hold the sliding doors as shown in Fig. 204. Note that this is in the form of a single groove wide, enough for both doors, with comfortable freedom for movement. A second groove is worked at the bottom to take a dividing bead. In practice the simplest plan is to work the narrow centre bead first down to the finished depth, and

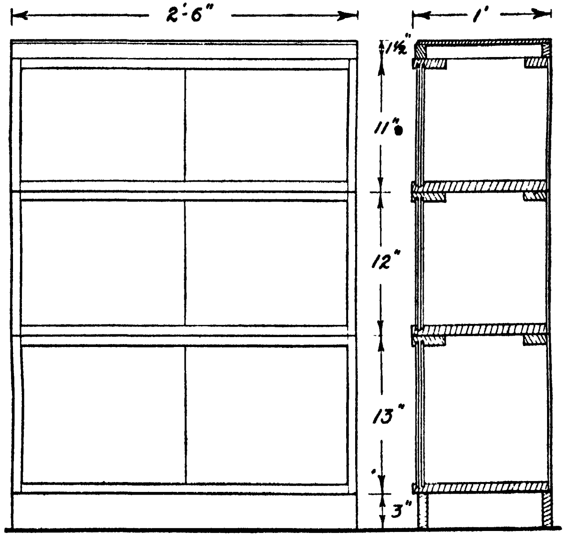


FIG. 202.—FRONT ELEVATION AND SIDE SECTION.

cut the wide groove afterwards. Strips of fibre are laid in the grooves to ease the running.

At the top are two rails lap-dovetailed in. The back one is flush with the rebate, and the front one is grooved for the doors similarly to the bottom. There are no strips of fibre in the top grooves, but gaps are allowed so that the doors can be added afterwards. This is done by passing each door upwards into its top groove, then allowing it to drop down into the bottom groove.

TOP

This is made in the form of a frame of five pieces. The back is lap-dovetailed to the side pieces, whilst the front is

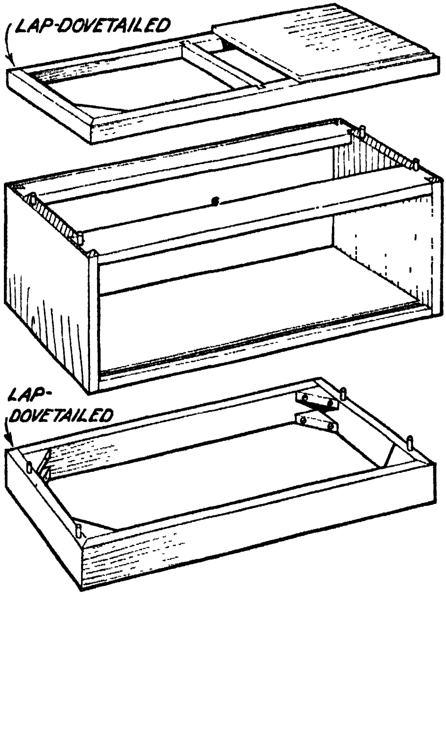


FIG. 203.—CONSTRUCTION OF THE TOP, BOOKCASE CARCASE, AND PLINTH.

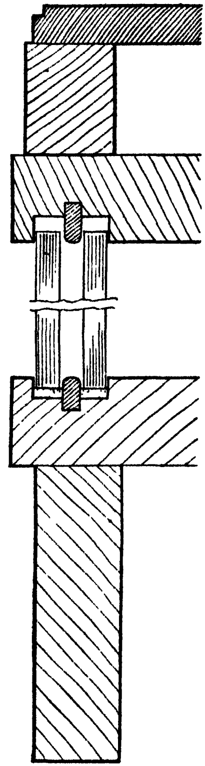


FIG. 204.—ENLARGED SECTION THROUGH FRONT.

mitred. In the middle a centre rail is slot-dovetailed in as in Fig. 203. When the whole has been assembled, corner brackets are glued and screwed in the front angles to strengthen the mitres. Fix the top with screws driven

upwards through the framework. The screw holes towards and at the back should be in the form of wide slots so that in the event of shrinkage the top will not split. Front and side edges are moulded as shown in the enlarged section in Fig. 204.

PLINTH

Fig. 203 shows how this is made. Front corners are mitred, whilst the back is lap-dovetailed in. Note the corner brackets glued and screwed in to strengthen the joints.

To hold the sections in position dowels are used. It is obviously important that these coincide so that the sections are interchangeable. To ensure this a piece of ply should be marked out, the dowel positions being pricked through small holes so that an awl can be passed through for marking. In this way the sections can be altered about, the dowels always fitting.

CUTTING LIST

	Length.	Width.	Thickness.
Bookcase section (11 in. size):			
2 Ends . . .	11¼ in.	12¼ in.	⅞ in.
1 Bottom . .	2 ft. 6 in.	12 ,,	⅞ ,,
1 Rail . . .	2 ,, 6 ,,	3¼ ,,	⅞ ,,
1 ,, . . .	2 ,, 6 ,,	2¼ ,,	⅞ ,,
1 Back . . .	2 ,, 6 ,,	11¼ ,,	¼ ,,
For 12 in. size ends should be 12¼ in. long.			
,, 13 ,, ,, 13¼ in. ,,			
Top:			
1 Top . . .	2 ft. 6¼ in.	12¼ in.	⅜ in.
1 Rail . . .	2 ,, 6¼ ,,	1¼ ,,	⅞ ,,
1 ,, . . .	2 ,, 6 ,,	1¼ ,,	⅞ ,,
2 ,, . . .	1 ,, ¼ ,,	1¼ ,,	⅞ ,,
1 ,, . . .	11¾ in.	1¼ ,,	⅞ ,,
Plinth:			
1 Front . . .	2 ft. 6¼ in.	3¼ ,,	⅞ ,,
1 Back . . .	2 ft.	3¼ ,,	⅞ ,,
2 Sides . . .	1 ,,	3¼ ,,	⅞ ,,

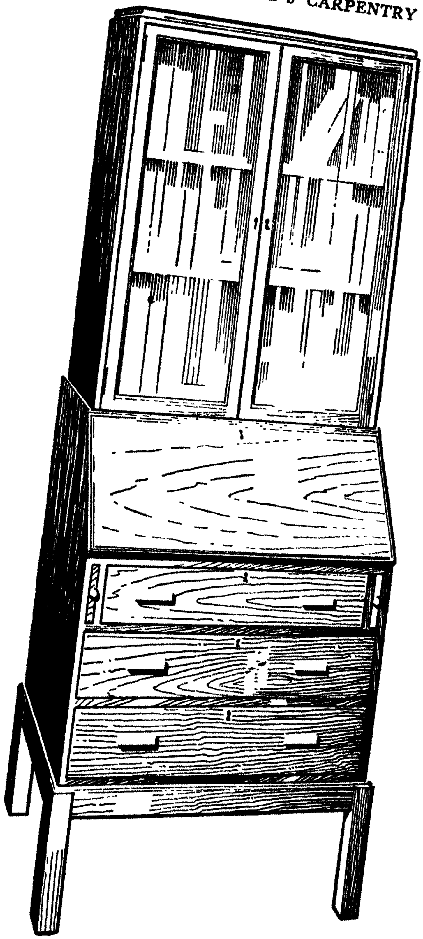


FIG. 205.—ATTRACTIVE MODERN-STYLE BUREAU BOOKCASE.
Bureau portion is 39½ ins. high by 27 ins. wide. Bookcase (optional) stands 32¾ ins. high.

Bureau Bookcase

You can make this in the form of a bureau only, omitting the bookcase, or make it complete as it is. Oak is the most suitable wood to use so far as show wood is concerned, though concealed parts could be in deal.

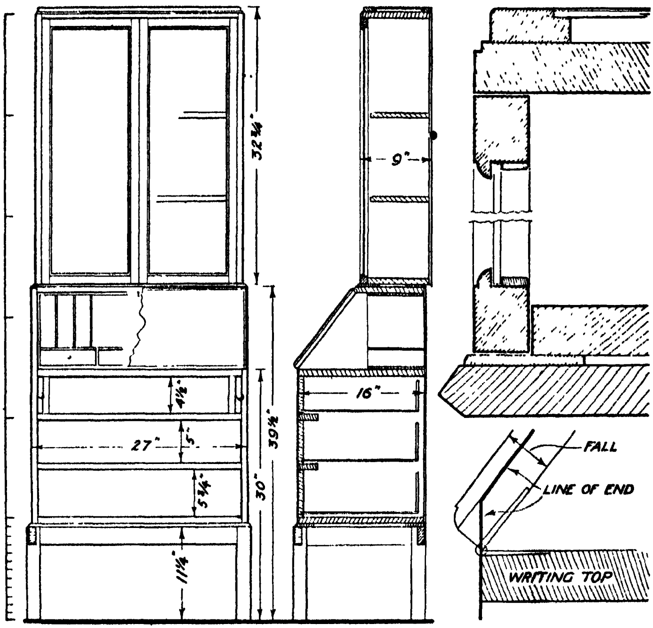


Fig. 206.—Scale Elevations and Enlarged Detail of Parts.

BUREAU

It is strongly advisable to set out this in full size first, at any rate in side elevation. In this way you will get the correct arrangement of the fall in relation to the writing-top. This is most important, because otherwise there may be serious discrepancy when the fall is fitted. Follow the drawing shown in Fig. 206. Note the slope of the end does

not begin level with the writing-top; it begins a short way above it. The reason for this is that it has to line up with the rebate of the fall. The best plan is to draw in the position of the writing-top so that it is 30 in. from the ground. Plot in the position of the fall when in the closed position, and make the line of the end level with the rebate.

The construction of the main carcase is shown in Fig. 207.

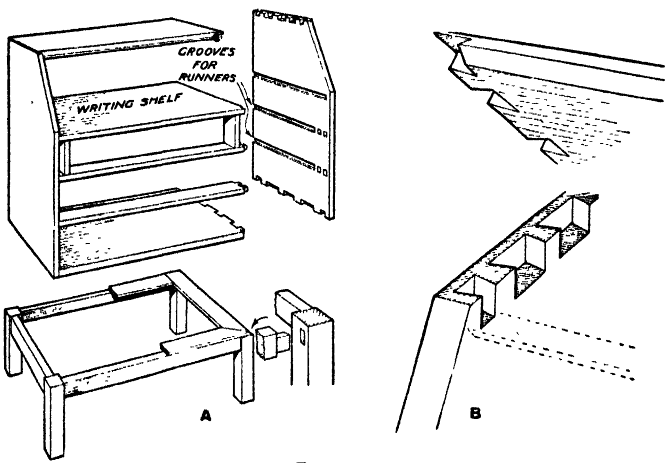


FIG. 207.
A. Bureau and stand construction.
B. Detail of bureau top joints.

In the best way the bottom is lap-dovetailed into the ends, whilst the top is double lap-dovetailed as shown in Fig. 207. In this way you have only a thin line of end grain showing at the sides. For full concealment you could use the mitre-dovetail, but this is rather a more difficult joint to cut. In a simpler way you could substitute a plain lapped joint, but in this case the whole thing would have to be nailed as well as glued.

The writing shelf fits in a stopped groove, the front corners being shouldered accordingly. The drawer rails are double-tenoned in. Grooves are required for the runners level with the rails. These details are given in Fig. 207. When preparing the top allow it rather full in width, and do not chamfer the front edges until after the joints have been cut. In fact the top chamfer can be worked after the whole carcase has been assembled. Rebates are needed at the back of the ends and the top. The bottom stands in flush with the rebate. This applies also to the writing shelf.

When assembling glue the small uprights between the writing shelf and upper drawer rail, fix the writing shelf and drawer rails to the ends, add the bottom and finally knock in the top. When the glue has set, level all joints. The back can be of plywood nailed or screwed in.

The stationery nest can follow the suggestion given in Fig. 206, but any alternative idea can be carried out. The important thing is to make the compartments of a size to suit the general run of stationery. For a simple job the whole thing can be glued and nailed together, the joints being butted. In this case, assuming that the front edges are to be rounded over, the partitions can stand in slightly to avoid complications at the front.

There is no special point in the drawer construction. A description of drawer-making is given on page 112. The sides are lap-dovetailed at the front and through-dovetailed at the back. The lopers or slides have dowels inserted near the back to prevent them from being pulled right out. They stop against the uprights.

The method of making the stand is given in Fig. 207. The rails are tenoned into the legs and, in order to make the tenons of maximum length, they are cut off at an angle at the end so that they practically meet in the thickness of the leg. After assembling, the top edges are

levelled and a moulding planted on top; this is mitred at the front corners and butted at the back.

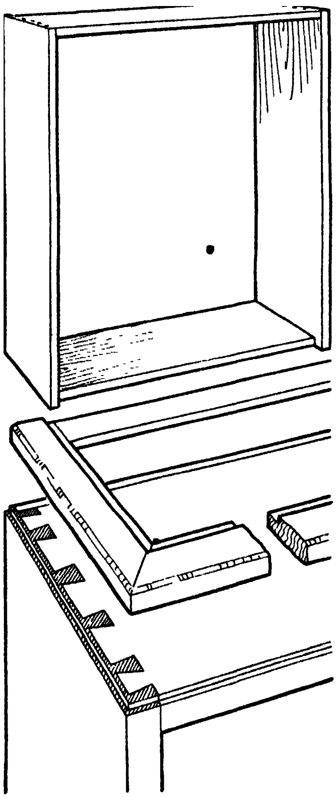


FIG. 208.—HOW BOOKCASE IS MADE, AND (*below*) HOW TOP CORNICE IS MADE.

Fig. 208 shows the construction of the bookcase carcase. It is lap-dovetailed together. Notice that whilst the top is flush at the front, the bottom stands in by the thickness of the doors. After assembling, a small rebate is worked round the top to form the bottom quirk of the moulding, and the moulding proper planted above this; see Fig. 208. Note that an inner rebate is worked around the front and side mouldings to allow a thin top to be dropped in flush. The back strip is level with this rebate.

A moulding is planted on top of the lower carcase above which the bookcase stands (note that if the bookcase is not required the moulding is omitted). Blocks are fixed to the underside of the bookcase to position it to the bureau.

The section of the door members is given in Fig. 206. The parts are rebated and moulded, the rebate being level with the quirk of the moulding. The general construction

Cutting List

	Length.	Width.	Thickness.
Bureau :			
2 Ends	2 ft. 4½ in.	16¼ in.	¾ in.
1 Top	2 ” 3¼ ”	9¼ ”	¾ ”
1 Writing shelf	2 ” 2½ ”	16 ”	¾ ”
1 Bottom	2 ” 3 ”	16 ”	¾ ”
2 Rails	2 ” 3 ”	2¾ ”	¾ ”
2 Uprights	6¼ ins.	2¾ ”	¾ ”
1 Back	2 ft. 4½ in.	27 ”	¼ ”
2 Runners	1 ” 2 ”	2¾ ”	¾ ”
2 ”	1 ” 2 ”	2 ”	¾ ”
2 Lopers	1 ” 4 ”	4¾ ”	¾ ”
1 Fall	2 ” 3 ”	12¾ ”	¾ ”
1 Drawer front	1 ” 11 ”	4¾ ”	⅞ ”
1 ” ”	2 ” 2 ”	5¼ ”	⅞ ”
1 ” ”	2 ” 2 ”	6 ”	⅞ ”
2 ” sides	1 ” 3½ ”	4¾ ”	⅜ ”
2 ” ”	1 ” 3½ ”	5¼ ”	⅜ ”
2 ” ”	1 ” 3½ ”	6 ”	⅜ ”
1 ” back	1 ” 11 ”	4½ ”	⅜ ”
1 ” ”	2 ” 2 ”	5 ”	⅜ ”
1 ” ”	2 ” 2 ”	5¾ ”	⅜ ”
1 ” bottom	1 ” 10¼ ”	15 ”	¼ ”
2 ” ”	2 ” 1½ ”	15 ”	¼ ”
1 Moulding	2 ” 3½ ”	2¼ ”	¼ ”
2 ”	9½ in.	2¼ ”	¼ ”
1 ”	1 ft. 11½ in.	2¼ ”	¼ ”
Stationery nest and other small parts extra.			
Stand :			
4 Legs	11¾ in.	2 in.	2 in.
2 Rails	2 ft. 3 in.	2¼ ”	⅞ ”
2 ”	1 ” 4 ”	2¼ ”	⅞ ”
1 Moulding	2 ” 3½ ”	2¾ ”	¼ ”
2 ”	1 ” 4½ ”	2¾ ”	¼ ”
1 ”	1 ” 11½ ”	2¾ ”	¼ ”
Bookcase :			
2 Ends	2 ” 8¾ ”	9¼ ”	¾ ”
1 Top	2 ” 2 ”	9 ”	¾ ”
1 Bottom	2 ” 2 ”	8¼ ”	¾ ”
1 Back	2 ” 8¾ ”	26 ”	¼ ”
2 Shelves	2 ” 1 ”	8 ”	¾ ”
1 Moulding	2 ” 2 ”	1½ ”	½ ”
2 ”	9 in.	1½ ”	½ ”
1 ”	2 ft. 0 in.	1½ ”	⅜ ”
4 Stiles	2 ” 8½ ”	1¾ ”	⅞ ”
4 Rails	1 ” ½ ”	1¾ ”	⅞ ”
1 Upper top	2 ” ¼ ”	7 ”	3/16 ”

is similar to that of the door given on page 99. The moulding is cut away locally at the joints, and is mitred. Consequently when calculating the shoulder lengths of the rails remember that they have to reach up to the quirk. The glass is fitted in from the back and is held by beads.

Shelves can be added as required. The simplest way of supporting them is to screw fillets to the inside of the ends. Fix them in positions which will give ample clearance for the average size of book.

CHAPTER VII

THE DINING ROOM

Pair of Bellows

The shape of these bellows has the advantage that the leather part can be kept straight. Oak is the best wood to use, though any reliable hardwood can be substituted. The nozzle can be obtained ready made in brass, and requires only to be screwed on. It should be obtained first, because the wood nozzle piece to which it is fixed must be of a size to suit it. The back forms the main structure and contains the valve. The latter consists of a rebated valve with a hole in it which is screwed to the back. On its inner face is a strip of leather held at one end by a screwed-on strip. To keep the leather flat, a wood block is glued on as shown in Fig. 211. As the bellows are opened the air rushes in through the hole, the leather bending inwards. Closing the bellows causes the air to press against the leather, so shutting the valve, and forcing the air out of the nozzle.

The thin end of the back is built up to take the nozzle piece, all pieces being ½ in. thick. To the top piece the top is hinged, and, to prevent it from closing too much, a strip, also ½ in. thick, is glued and nailed across the wide part of the back. It also serves to strengthen the back where it is cut away to take the valve. Note that, although the handle of the back is all in one with the latter, the top handle is separate, being screwed on. This gives clearance for the fingers when the bellows are used.

Cut out the back to the sizes given in Fig. 210, working from a centre line. Prepare also the front to agree with it. Cut the hole in the back for the valve, 2½ in. by 2 in.,

and glue on the two blocks at the narrow end. Allow them full and trim when the glue has set. Bore a ⅞-in. hole at the end to hold the nozzle piece (or whatever size may be needed for the nozzle), stopping it level with the

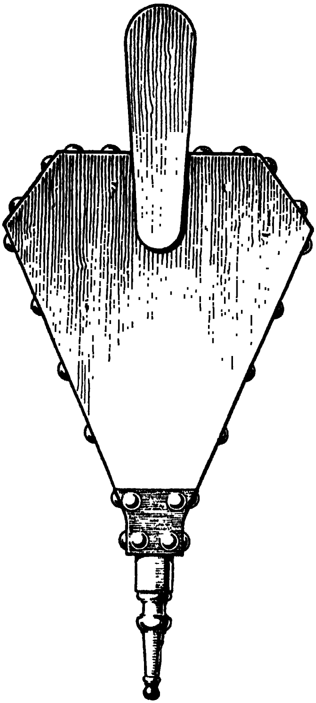


Fig. 209.—Attractive Pair of Bellows.

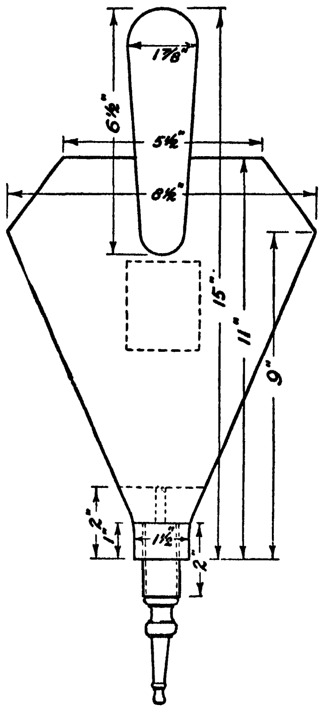


Fig. 210.—Front View with Main Sizes.

end of the top block. With a $\frac{5}{16}$-in. or ⅜-in. bit continue the hole right through the middle block (see dotted lines in Fig. 211). The nozzle piece can be a piece of ⅞-in. dowel, or it can be made from a piece of hardwood. Bore a hole through it, and glue it in its hole. Hinge the front, letting in the hinge flush. A neater finish for the leather

is secured if a sloping rebate is worked around the edges of front and back, but it is not essential.

Prepare the valve as shown in Fig. 211. Fit the valve plate first, rebating it so that the extending flange allows fixing screws to be driven in. Glue the wood block to the

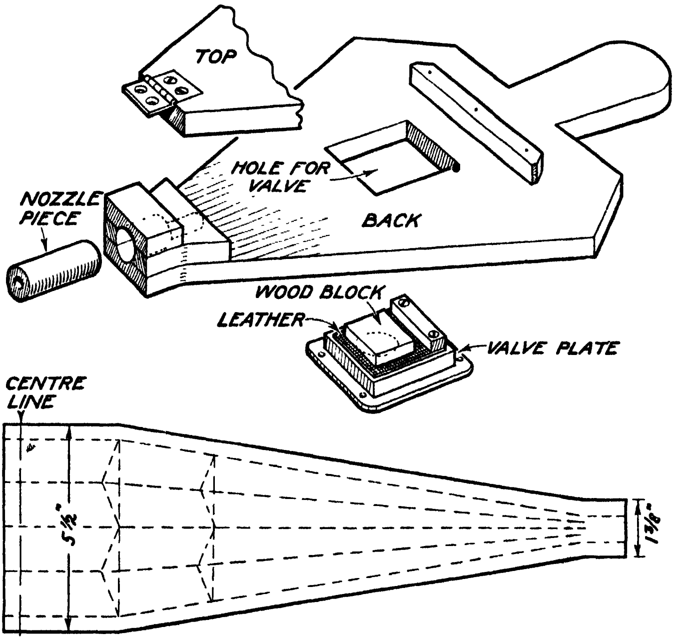


FIG. 211.—DETAILS OF CONSTRUCTION AND ONE-HALF OF THE LEATHER SIDES.

leather, and when set screw it to the valve plate with a wood strip. Now give any finish to the woodwork that is desired; wax polish is excellent for oak.

The leather is made in two pieces glued together at the middle. It should be soft, pliable leather. Fig. 211 shows the approximate shape, but a template of brown paper should be prepared so that the exact size and positions

of the folds can be seen. The two pieces are glued together after fitting. Damp the leather, fold it in two down the centre, and press it. Fold the edges in $\frac{3}{8}$ in. where it fits the edges of front and back, and, midway between these and the centre fold, make another fold. Now make upright folds at the corner positions, and, by manipulating with the fingers of both hands, form the small diagonal folds. Press under weights and allow to dry.

When the fitting is satisfactory glue the two pieces, and, having marked the exact length, fix to the edges of the bellows with glue and tacks. Start at the handle and work forwards, snipping the leather where necessary. Fix when in the open position. Follow with a piece of gimp all round the edges, fixing with brass-head nails (Fig. 209). Finally bind a piece of leather over the hinge and right round, glueing and driving in brass nails, and screw on the brass nozzle.

CUTTING LIST

	Length.	Width.	Thickness.
1 Back . . .	$15\frac{1}{2}$ in.	$8\frac{3}{4}$ in.	$\frac{1}{2}$ in.
1 Front . . .	$10\frac{1}{2}$,,	$8\frac{3}{4}$,,	$\frac{1}{2}$,,
1 Nozzle block .	$2\frac{1}{4}$,,	$2\frac{3}{4}$,,	$\frac{1}{2}$,,
1 ,, ,, .	$1\frac{1}{4}$,,	$1\frac{3}{4}$,,	$\frac{1}{2}$,,
1 ,, piece .	$2\frac{1}{4}$,,	$\frac{7}{8}$,, diam. finished	
1 Strip . . .	$6\frac{1}{2}$,,	$\frac{1}{2}$,,	$\frac{1}{2}$,,
1 Valve plate .	$3\frac{1}{4}$,,	$2\frac{3}{4}$,,	$\frac{1}{2}$,,
1 Wood block .	2 ,,	$1\frac{3}{4}$,,	$\frac{1}{4}$,,
1 ,, strip . .	2 ,,	$\frac{1}{4}$,,	$\frac{1}{4}$,,
1 Front handle .	7 ,,	2 ,,	$\frac{1}{2}$,,

FIRE SCREEN

The construction of this screen is so obvious that little is needed in the way of description. Assuming that plywood is used for the screen part and panel, the article

may be made either for enamelling or for polishing. In the latter case the side and top edges of the main upright (*A*) and the top edge of the panel (*C*) should be lipped by glueing a strip of solid stuff to hide the raw edges. In the case of enamelling, this is not necessary. Shape the

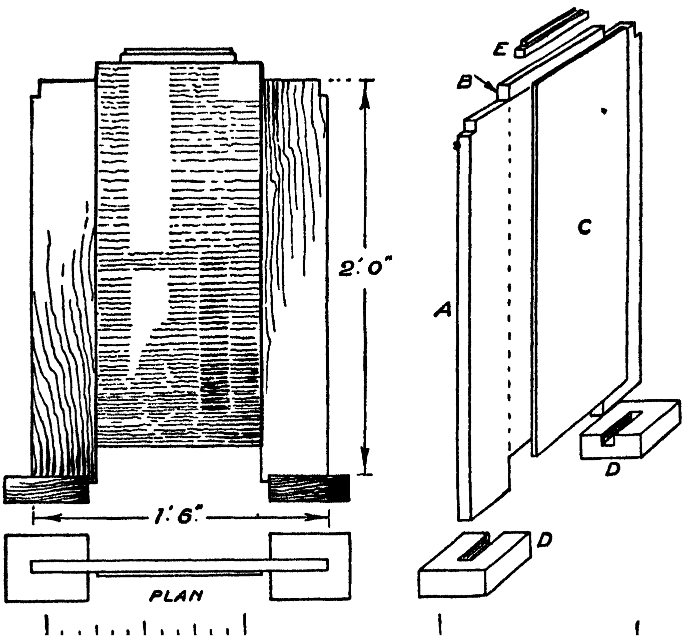


FIG. 212.—ATTRACTIVE FIRE SCREEN WITH DETAILS OF CONSTRUCTION.

upright and glue on the top piece (*B*) to afford a bearing for the panel. The edges of the panel (*C*) must be accurately true. It is fixed on to the upright with very fine panel pins, the holes left by which may be afterwards stopped. The strips (*E*) are of solid wood, glued on.

The feet should be of a heavy wood not less than $1\frac{1}{2}$ in. thick. They are slotted about $\frac{3}{8}$ in. deep to take the

ends of the upright (*A*). The parts are glued, and a long screw at each side, driven in from below, will hold all tight.

For a polished screen, oak-faced plywood may be used. If the grain of the panel is placed horizontally, this will afford a pleasing contrast.

CUTTING LIST

*	Length.	Width.	Thickness.
(*A*) Upright	2 ft. 0 in.	18 in.	½-in. ply
(*B*) Back top piece	10 in.	1 „	½ in.
(*C*) Overlay panel	1 ft. 11 in.	10 „	¼-in. ply
(*D*) Two feet	5 in.	4 „	1½ in.
(*E*) Strip	7 „	½ „	½ „
„	6½ „	¼ „	¼ „

TEA TROLLEY

This is a handy item for use either in the living-room or in the garden. It has two useful shelves, and the legs are fitted with 3-in. rubber-tyred castors to enable it to run easily over carpets. The shelves have an edging at back and sides to prevent things from being pushed off, whilst the front is left clear so that a tray can be easily pushed on. Oak is a suitable wood to use, though actually any hard wood could be used. The shelves are of ½-in. plywood lipped at the front edges. Two methods are suggested for fixing the shelves. The simpler way shown in Fig. 215 is to allow the rails extra deep and to fix supporting fillets. In the other, Fig. 216, the rails are shallower, and are rebated to hold the shelves at the underside.

Prepare the legs first to finish 2 ft. 5 in. long by 1¼ in. square in section. Fix them together temporarily with a cramp and square across the positions of the rails. In

this way all will be marked alike. Note that the tenons are set down at the top edges to form a shoulder. The mortises in the legs must obviously be set down correspondingly. Another point to note is that the shelves rest upon the front rails. If it is decided to use the rebated method for fixing the shelves, the mortises must

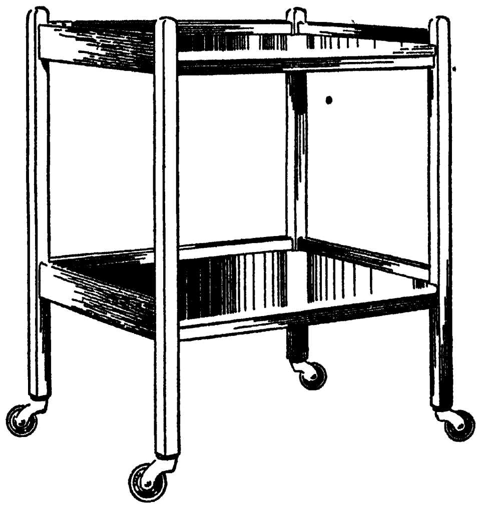


FIG. 213.—TEA TROLLEY OR SERVICE WAGON.
2 ft. 2 in. by 1 ft. 4 in. Height (over-all) 2 ft. 8 in.

be set up underneath as well as on top, because the rebating automatically reduces the width of the tenons.

When the marking is completed, the legs can be separated and the marks squared round on to the adjacent faces where required. The sides of the mortises are marked in with the gauge. The section on mortise and tenon joints shows how the joints are cut. In the back

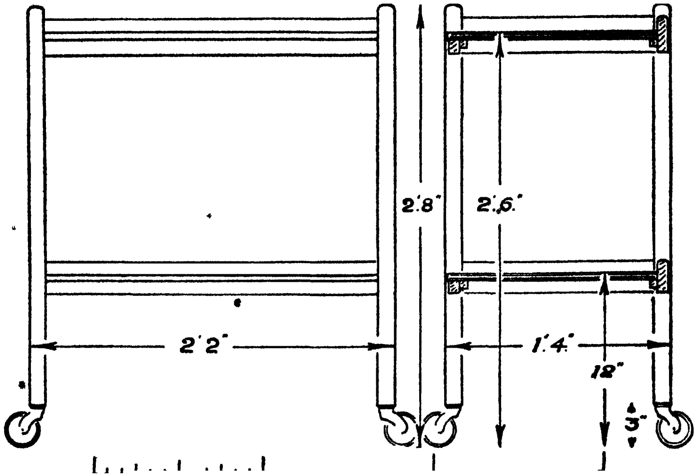


FIG. 214.—SCALE ELEVATIONS WITH SIZES.

legs the mortises will meet in the thickness of the legs. Next proceed with the rails. After cleaning up they

CUTTING LIST

	Length.	Width.	Thickness.
4 Legs	2 ft. 5½ in.	1¼ in.	1¼ in.
2 Top end rails . . .	1 ,, 4 ,,	2¾ ,,	¾ ,,
1 ,, back rail . . .	2 ,, 2 ,,	2¾ ,,	¾ ,,
2 Lower end rails . . .	1 ,, 4 ,,	2½ ,,	¾ ,,
1 ,, back rail . . .	2 ,, 2 ,,	2½ ,,	¾ ,,
2 Front rails (below shelves) .	2 ,, 2 ,,	1 ,,	¾ ,,
4 Shelf fillets (ends) . .	1 ,, 2 ,,	½ ,,	½ ,,
4 ,, (back) . .	2 ,, 0 ,,	½ ,,	½ ,,
2 Shelves (plywood) . .	2 ,, 0 ,,	15 ,,	½ ,,
2 Front edge lippings for shelf .	2 ,, 0 ,,	½ ,,	¼ ,,

Note that the length of legs allows for a rubber-tyred castor 3 in. high, excluding screw.

If the alternative method of fitting the shelves shown in Fig. 216 is preferred, the top rails are 2 in. by ¾ in. and the lower rails 1¾ in. by ¾ in. No fillets are required in this case, the shelves being screwed to the rebated rails.

can be cramped together in two sets to enable the shoulders to be squared across. Afterwards the marks are squared round each rail individually. Having cut all joints, they can be fitted and marks made on each, so that they can be replaced in the correct positions. When the whole

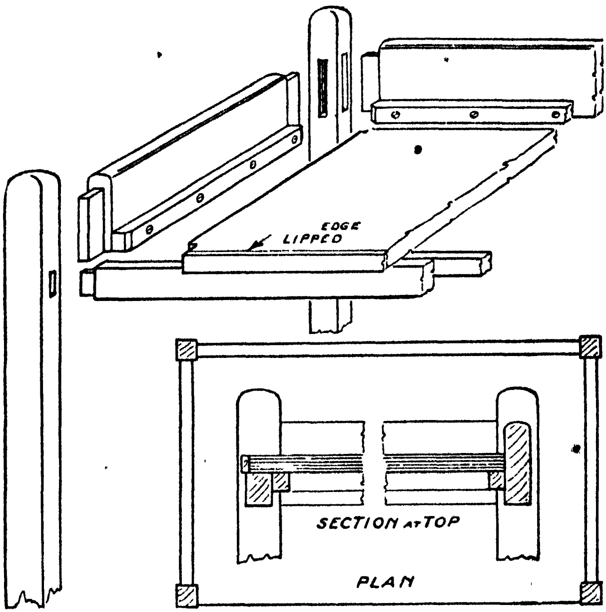


FIG. 215.—METHOD OF ASSEMBLY; ALSO PLAN AND SECTION.

has been tried together, the parts can be separated and cleaned up. The tops of the legs can be rounded also.

When glueing up, the two sides should be put together independently and the glue allowed to set before the remaining rails are added. If the rebated method of fixing the shelves is used, it will be necessary to add these when the front and back rails are put in. The corners have to be cut to fit round the legs. If they rest upon

fillets, they can be added after the whole has been put together. Remember to lip the front edges. In both methods the shelves are secured by screwing from below.

The fixing of the castors depends on the particular type used. They generally have a special collar, which is recessed in a hole in the bottom of the leg and is tapped home.

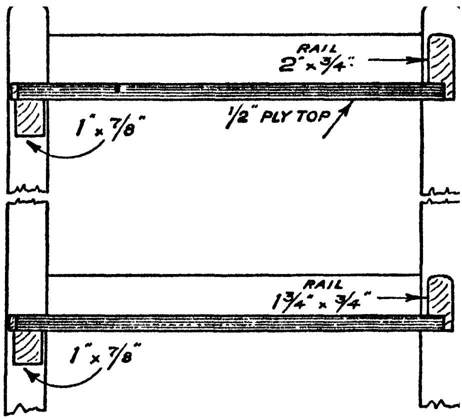


FIG. 216.—ALTERNATIVE METHOD OF FITTING SHELVES TO REBATED RAILS.

OAK DINING-TABLE

Although the extending dining-table has undoubted advantages, it is more complicated to make, and on this score the fixed table shown in Fig. 217 will probably appeal to readers. It has a top size of 5 ft. by 3 ft., convenient for the small house, and it is so designed that there are no awkward legs to be in the way of diners' knees. This is ensured by placing the uprights well in from the ends. These uprights are of the "solid" form so popular nowadays, though in reality they are made up of a framework with sheets of oak-veneered plywood fixed

on. This saves the necessity of handling heavy timbers, and at the same time simplifies the construction.

It will be seen that the table consists of three sets of parts (Fig. 219): the two uprights, the stretcher and top rails, and the top. These are all made up independently and assembled afterwards. Begin with the two uprights or legs. Each consists of a framework made as shown in Figs. 218 and 219. The two outer uprights are of oak, but the others can be of deal. It is advisable to set out

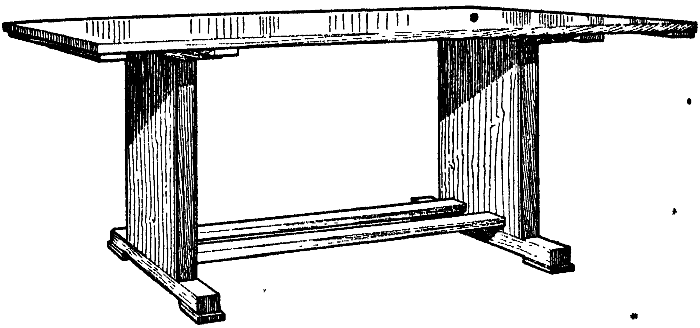


FIG. 217.—DINING-TABLE IN OAK.
Suitable for the small modern house.

the whole thing in full size, so that the various sizes can be ascertained exactly. The two outer uprights are notched or lapped at top and bottom to hold the rails, and the last-named have a series of notches in which the intermediate uprights fit. All the parts measure 2 in. by $\frac{7}{8}$ in. in section.

Cut out the parts in accordance with the full-size drawing, and fix them together in sets, so that they can be marked alike. The various notches are cut with saw and chisel, and after fitting the whole can be glued up. Fix all the intermediate uprights to the rails, driving in nails to hold them, and add the side uprights

afterwards. When the glue has set, the joints can be levelled and the plywood panels added. Note that the two inner panels have square holes cut in them to allow

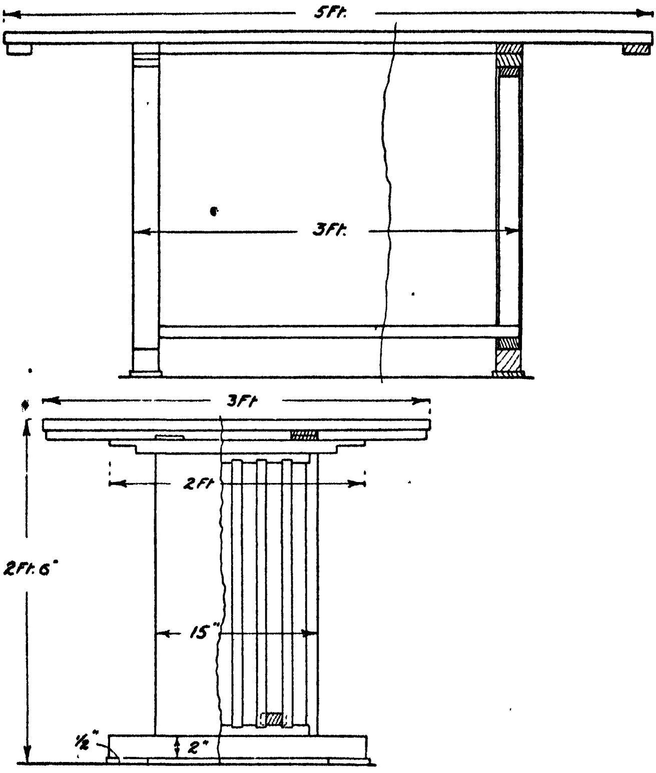


FIG. 218.—ELEVATIONS WITH MAIN SIZES.

the stretcher rails to pass in as shown to the right in Fig. 219. If thumbscrewed down, glue alone will hold the panels. Otherwise fine panel pins must be driven in, these being punched in and the holes filled with plastic wood.

The top cross-pieces follow. They are 2 ft. long, and the ends are cut away at the underside. Screws driven in downwards hold them in position. Next prepare the stretcher and top rails. The first-named are tenoned as shown in Fig 219, so that they pass through the holes in the plywood and rest immediately above the bottom rails of the legs. Place them in position and drive in screws

CUTTING LIST

	Length.	Width.	Thickness.
Legs :			
4 Uprights . .	2 ft. 1 in.	2⅛ in.	⅞ in.
10 ,, . .	2 ft.	2⅛ ,,	⅞ ,,
4 Rails . .	1 ft. 2½ in.	2⅛ ,,	⅞ ,,
4 Panels . .	2 ,, 1 ,,	15⅛ ,,	3/16-in. ply
2 Cross pieces .	2 ,, ½ ,,	2½ ,,	⅞ in.
2 ,, ,, .	2 ,, ½ ,,	2½ ,,	2 ,,
4 Feet . . .	4¼ in.	3 ,,	½ ,,
Stretchers :			
4 Pieces . .	3 ft. ½ in.	2⅝ ,,	⅞ ,,
Top :			
1 Piece . .	5 ,, ¼ ,,	3 ft. ⅛ in. (or pieces to make up width)	⅞ ,,
4 Cross battens .	3 ft.	2½ in.	⅞ ,,

from beneath to hold them. The top rails have halved joints cut at the ends so that the cross rails of the top can lie across them. They are screwed on as in Fig. 219. Now prepare the bottom cross-pieces. They are solid pieces of oak screwed up from beneath. The feet are plain blocks screwed under them.

The top can now be taken in hand. It can be made up of solid oak jointed together to produce the width of 3 ft. Beneath it four cross-battens are screwed as shown to the left in Fig. 219. The two inner ones must line up with the legs. They are halved to fit over the top rails so that they bed down flush on top of the cross-pieces of

the legs. If these cross-battens were screwed on rigidly, trouble might arise owing to the top shrinking and consequently splitting. To obviate this the centre screws

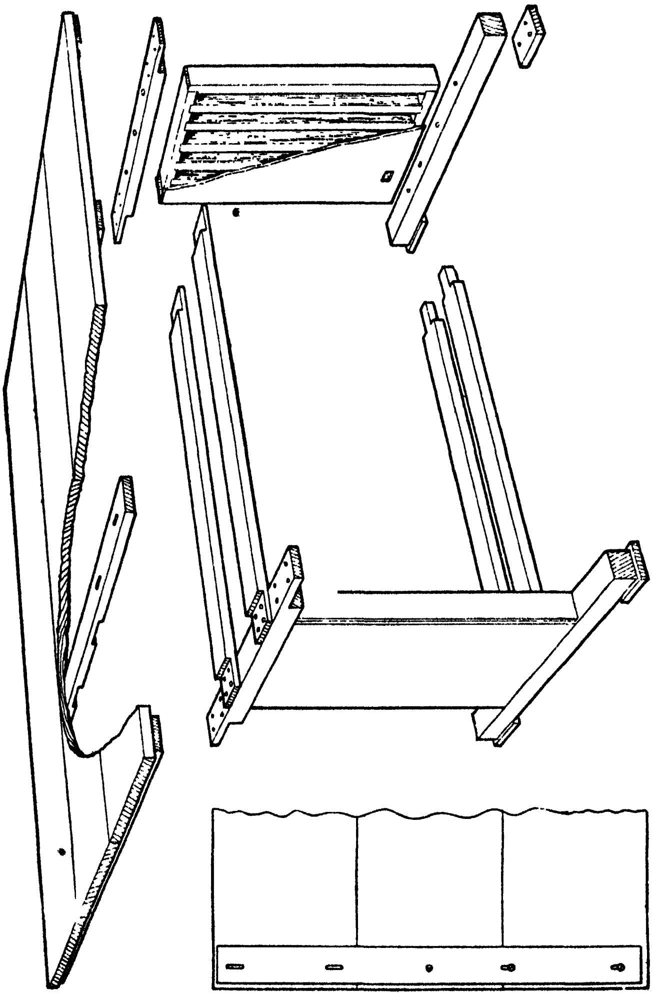


FIG. 219.—HOW THE PARTS ARE ASSEMBLED.

alone are driven in in the ordinary way. The others have slots rather than plain holes, so that the screws can pull along in the event of shrinkage. The whole thing is fixed with screws driven upwards through the top cross-pieces of the legs and through the top rails. Some might prefer to use a top of veneered ½-in. plywood. In this

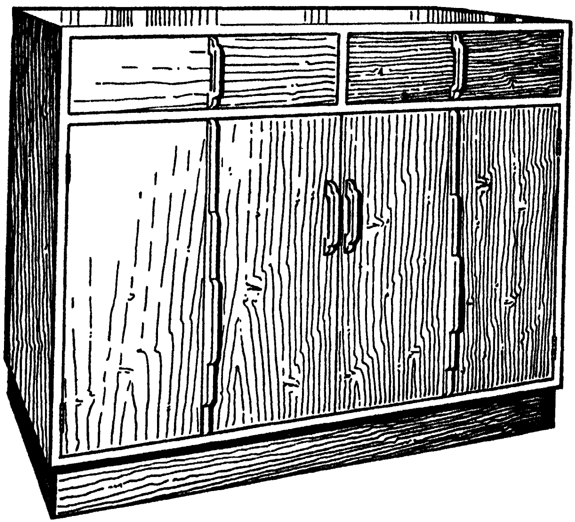


FIG. 220.—OAK SIDEBOARD.
3 ft. 6 in. in length, suitable for cottage or small house.

case there would be no trouble due to shrinkage, but it would be necessary to thickness the edges and apply a lipping to hide the layers.

SMALL SIDEBOARD IN OAK

The sideboard shown in Fig. 220 is what is generally known as the cottage type. It is small in size, making it suitable for the small house, but it has maximum accom-

modation. There are two drawers and a large cupboard space, sufficient for all the usual items to be kept in the living-room. The construction is simple, and, with the exception of the doors, which are of plywood, can be made entirely in solid wood. Oak-veneered ply is advisable for the doors because of their width. Solid wood would probably shrink, and possibly warp unless well seasoned.

The main sizes can be taken from Fig. 221 and the

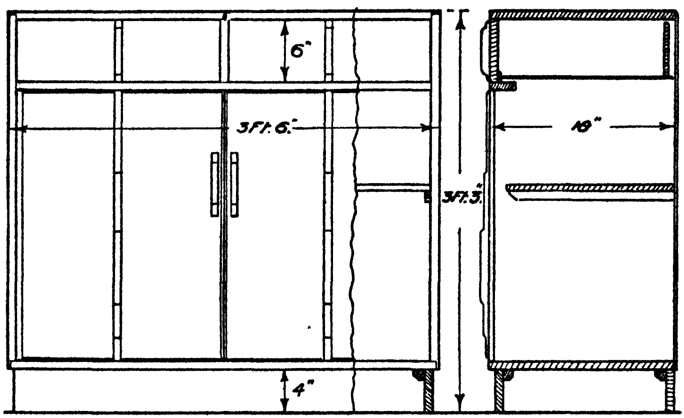


FIG. 221.—FRONT ELEVATION AND SIDE SECTION WITH CHIEF SIZES.

construction from Fig. 222. Prepare the two sides first. They are short of the over-all size by the thickness of the lap made in the top. As $\frac{7}{8}$-in. wood is being used, the lap can conveniently be $\frac{3}{16}$ in. Plane the two pieces square, and, placing them together, mark the position of the mortises which hold the drawer rail (Fig. 222). The lapped joint at the bottom is gauged in and cut by sawing across the grain and chopping away the waste.

Now proceed with the top and bottom. The former extends to the over-all size, and lapped joints are cut at

the ends. The bottom is short by the thickness of the laps cut in the sides. This brings it to 3 ft. $5\frac{5}{8}$ in. Cut out also the drawer rail, and saw the tenons at the ends, making the shoulder size to agree with that of the top. The drawer division has to be tenoned between the top

CUTTING LIST

	Length.	Width.	Thickness.
2 Sides .	2 ft. $11\frac{1}{4}$ in.	in.	$\frac{7}{8}$ in.
1 Top .	3 ,, $6\frac{1}{4}$	,,	$\frac{7}{8}$
1 Bottom	3 ,, 6		$\frac{7}{8}$
1 Rail .	3 ,, 6		
1 Division	$7\frac{3}{4}$ in.		
1 Upright	2 ft. $11\frac{1}{4}$ in.		
2 Runners	4		
1 Runner	4		
1 Guide	4		
2 Plinths	5	$4\frac{1}{8}$	
2 ,,	6	$4\frac{1}{8}$	
1 Shelf .	$4\frac{1}{2}$	16	
2 Bearers	4	$1\frac{1}{2}$	
1 Back .	6	2 ft. 11	ply
2 Doors	$2\frac{1}{2}$	20	
2 Uprights	3	$\frac{7}{8}$	
2 Fronts	$8\frac{1}{4}$	$6\frac{1}{8}$	
4 Sides .	6	$6\frac{1}{8}$	
2 Backs .	$8\frac{1}{4}$	6	5 ,,
2 Bottoms	$7\frac{1}{4}$	17	$\frac{3}{16}$-in. ply

Edgings and small parts extra.
2 Pairs $1\frac{1}{2}$-in. brass butt hinges.
1 Lock, 2 bolts.

and the rail, and the mortises can be marked out by fixing the two parts together and squaring the lines across the edges. At the back of the drawer rail shallow slots or mortises have to be cut to take the stub tenons of the drawer runners (Fig. 222).

The parts can now be glued up. Cramp the drawer rail in position and add the bottom, driving in nails dovetail fashion. Place the drawer division in its mortise and add the top. The nails should have small heads

and be driven through the sides into the top. They are punched home. The side drawer runners have stub-tenons cut at the front to fit into the rail, and at the back they are cut off at an angle so that they can be

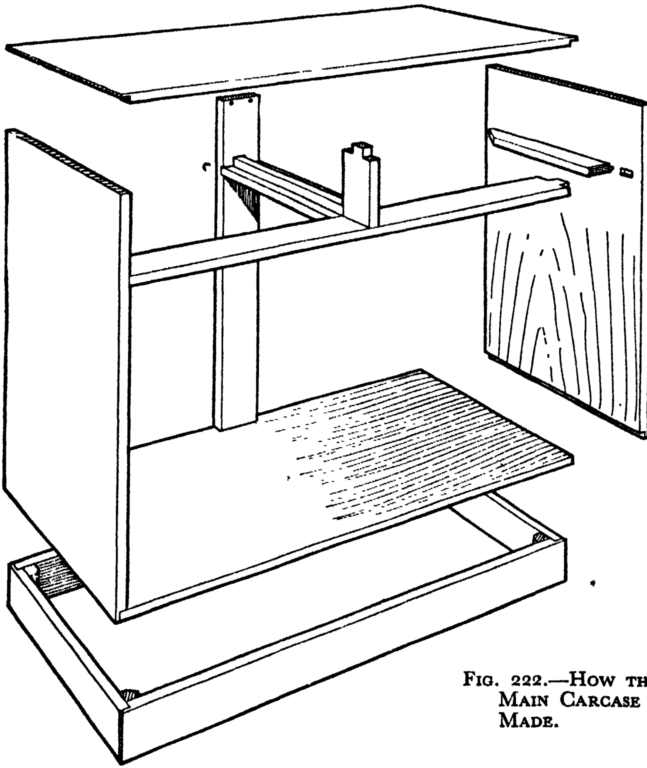


FIG. 222.—HOW THE MAIN CARCASE IS MADE.

screwed to the sides. At the centre of the back an upright is screwed into notches cut in the top and bottom. The centre drawer runner rests in a notch cut in this. At the front it is stub-tenoned similarly to the side runners. Above it a guide is fixed with glue and nails.

Fig. 222 shows how the plinth is put together with lapped joints. It can be fixed with screws driven downward through the bottom and strengthened with glue blocks rubbed in the angles. The back is a sheet of plywood screwed on.

Fig. 223 gives details of the door construction. They are sheets of ½-in. plywood edged all round to conceal the layers. Note that the edgings at the hingeing sides

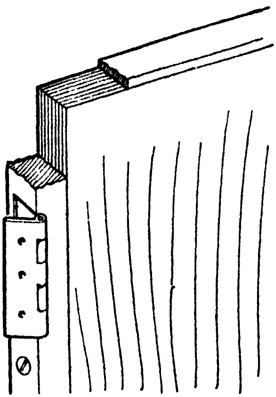


FIG. 223.—METHOD OF EDGING THE DOORS.

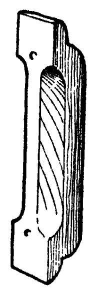


FIG. 224.—VIEW OF HANDLE FROM REAR.

are ½ in. thick, and are screwed on as well as glued. If this is not done it may be difficult to obtain a firm fixing for the hinges. Down the centre of each a stepped strip is fixed. This is ¾ in. wide, and is ¾ in. thick at the thickest part. Details of the handles are given in Fig. 224. It is advisable to hollow out the edges at the back to provide a finger-grip.

A simple method of making the drawers is given in Fig. 225. The fronts are lapped to take the sides, whilst the back fits in grooves cut across the sides. Drawer bottom mouldings can be obtained ready made to hold

the bottoms. The last-named are of $\frac{3}{16}$-in. plywood. Handles similar to those of the doors are screwed on from inside. The addition of a shelf resting on bearers screwed to the sides completes the woodwork.

A coat of stain (walnut stain looks very well) followed by wax polishing gives a suitable finish. If desired, the plinth can be stained a darker shade than the rest of the job.

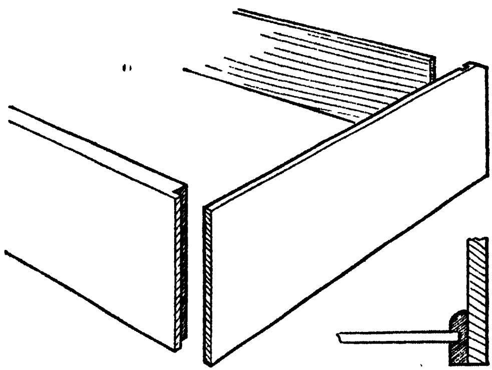


FIG. 225.—CONSTRUCTION OF DRAWERS.

DINING-ROOM CHAIRS IN OAK

The design in Fig. 226 is simple and straightforward, and makes a good sound chair which will stand up to everday use. It should preferably be in oak, though other sound hardwood, such as beech or ash, could be used. The seat is of the drop-in style, and is webbed and stuffed. Assuming that a number of chairs are to be made, it is advisable to make a template of the back legs in ply, as this will enable them to be marked out economically. Note that the back rails curve backwards, and this means that the template will have to be made extra wide at the top so that the legs will line up with the rail. This is shown by the dotted line in the side elevation in Fig. 227.

Cut out the front legs to finish $1\frac{3}{4}$ in. square, and mark out the mortise positions for seat rails and side stretchers. The front rail is tenoned in square, but the side seat rails will have to be mortised at an angle to suit the plan shape.

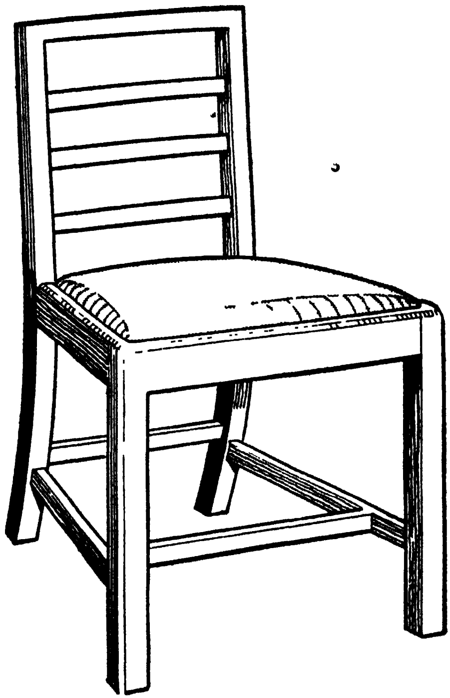


FIG. 226.—DINING-ROOM CHAIR IN OAK.

If preferred, the side rails can be dowelled (3 dowels, $\frac{3}{8}$ in.), in which case the dowels must slope at an angle in line with the seat shape. This dowelling should be done after the front rail has been glued to the legs, because the dowels pass through the tenons and lock them. The rounding of the outer corners is done after jointing.

The same thing applies to the rounding of the top edges of the rails.

Fig. 227 shows the shape of the back legs, and a template should be prepared. To simplify construction the back rails can be straight, in which case the template can be made to the solid line. If the rails are to curve as shown

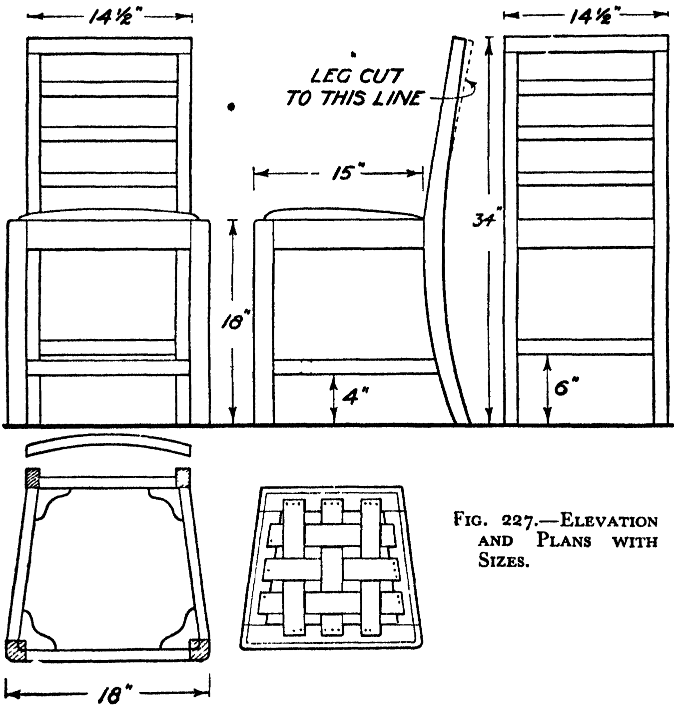


FIG. 227.—ELEVATION AND PLANS WITH SIZES.

by the plan, however, the template must be made to the dotted line. The excess is planed away after the back has been glued up. In any case, the back seat rail is straight. Note that it is essential that where the seat rails join the back legs the front surface must be vertical, so that when

the square shoulders of the rails are glued in the legs will be at the right angle. A width of $4\frac{1}{2}$ ins. is needed to cut the shape, though by marking a number of legs an economy can be effected in the total amount of wood needed.

All the joints are the mortise and tenon, and the mortises are cut in square whether the rails are bowed or not. This means that the tenons of bowed rails must be square

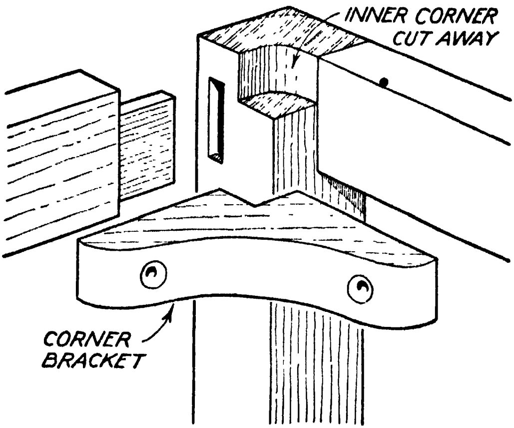


FIG. 228.—JOINT DETAIL OF FRONT LEG.

—that is, parallel with a straight line drawn straight across the back. Glue front and back frames together independently, and when the glue has set, level the legs to line up with the curve of the rails. This means that the front and back surfaces will have to be planed away at an angle towards the top.

The addition of the side seat and stretcher rails completes the main framework. Note that the stretcher rail parallel with the front joins the side stretchers, and, to obtain the exact shoulder length, a plan drawing is desirable. This will also give the angle of the shoulders of both the stretcher and the seat rails. When glueing, the

stretcher rail is slipped in, and the whole cramped. Test for squareness, and, when the glue has set, prepare corner brackets as shown in Figs. 227 and 228. These are necessarily at an angle, and must be cut to fit around the the legs. They should be fitted individually and glued and screwed. They not only strengthen the joints, but also form a bearing for the drop-in seat frame. This means that they must be set down by the thickness of the frame at the edge.

For the seat frame either tenoned or halved joints can be used. In the latter case the joints should be screwed as well as glued. Fit the frame, leaving a gap of about $\frac{1}{8}$ in. all round to allow for the thickness of the covering material. Run a chamfer about $\frac{1}{2}$ in. wide around the top edges as suggested in Fig. 227. The bottom of the bevel should be level with the top of the seat rails. Take off all sharp corners and edges.

Begin the upholstery by stretching webbing as in Fig. 227, interlacing the webbing and using $\frac{1}{2}$-in. webbing tucks. The ends should be doubled over. Cover this with a piece of canvas, tacking all round. Tack loose loops of twine around the edges and work hair stuffing beneath them. They serve to keep the latter in position. Now follows a second sheet of canvas, this being taken right over the edges and tacked beneath. Draw it tightly, keeping the corners neat and folding the canvas if necessary. Avoid lumpiness, however. The shape of the seat must be regulated as the work proceeds, balancing it from side to side, and making the front rather fuller than the back as shown by the side view in Fig. 227. A skewer can be passed through the canvas to help in regulating. No hair should pass down the edges, but the top should be firmly stuffed around front and sides. When satisfactory lay a sheet of cotton wool over the top (not letting it pass to the edges), and tack on the final

cover. If there is a pattern this will have to be centred, and the best plan is to knock in a temporary tack at front and back. It depends upon the material whether the corners will have to be snicked to make them neat.

CUTTING LIST

	Length.	Width	Thickness.
2 Back legs . .	2 ft. 10½ in.	5 in.	1¼ in.
2 Front ,, . .	1 ,, 6½ ,,	1¾ ,,	1¾ ,,
1 Front seat rail .	1 ,, 6 ,,	2¾ ,,	⅞ ,,
1 Back ,, ,, .	1 ,, 2½ ,,	2¾ ,,	⅞ ,,
2 Side seat rails .	1 ,, 5 ,,	2¾ ,,	⅞ ,,
1 Back rail . .	1 ,, 3 ,,	1¾ ,,	2½ ,,
3 Back rails . .	1 ,, 3 ,,	1¾ ,,	1¾ ,,
1 Back stretcher .	1 ,, 2½ ,,	1⅜ ,,	⅝ ,,
1 Front ,, .	1 ,, 6 ,,	1⅜ ,,	⅝ ,,
2 Side stretchers .	1 ,, 6 ,,	1⅜ ,,	⅝ ,,

The 5-in width of the back legs is for cutting from a single piece. The back rails are shown 2½ in. thick to allow for a bow of 1 in.

CHAPTER VIII

THE LOUNGE

Draught Screen

A screen of this type can be made with either soft material panels or wooden ones. The construction of the main framework is the same in both cases. The panels fit in rebates and are held with beads. The size given in Fig. 230 is suitable for most requirements, but can be altered if necessary. For instance, it might be desirable to adapt the size to suit a special pattern of cloth, especially if a needlework design were worked thereon.

For the main framework use wood to finish 1 in. thick if possible. Failing this, $\frac{7}{8}$ in. finished stuff must be used. Assuming that you propose to use reversible hinges (see Fig. 230), these should be obtained first, because it is essential that the distance between the centres of the knuckles is no less than the thickness of the wood. If it is a trifle more it does not matter, but it most certainly must not be less, otherwise the screen will bind when closed. If you prefer, you can use ordinary butt hinges, but of course in this case the screen opens one way only.

The main framework is made with plain square-edged parts put together with the simple mortise and tenon joint. The top rail is made wide enough to allow the curve to be cut in it. For a better-class job you could work the moulding in the solid, making the rails and stiles wide enough for the purpose. In this case the quirk of the moulding would have to be level with the rebate. The moulding would then be cut away locally at the joint

and be mitred. Fuller details on the cutting and fitting of this joint are given on page 91.

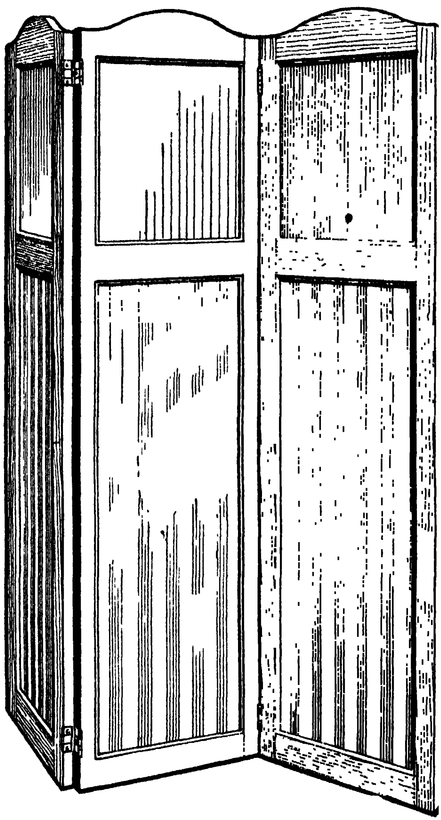


FIG. 229.—DRAUGHT SCREEN. HEIGHT 5 FT. 6 INS. OPENED WIDTH 4 FT.

Having cut the joints, glue up the frames, taking care to see that they are square and free from winding. Level the joints when the glue has set, and cut the shape in the

top rails. Mitre the moulding around the inner edges and fix with glue and fine nails, punching in the last named and filling the holes.

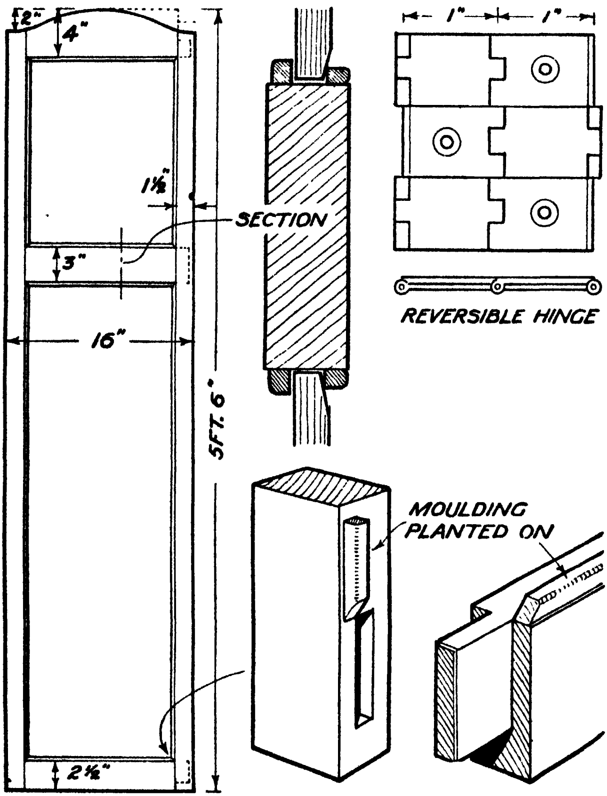


FIG. 230.—SCALE ELEVATION OF SCREEN, SECTION AND JOINT DETAILS.

If you are using wooden panels it will probably be necessary slightly to chamfer the edges at the back to enable beads to be mitred round to hold them. In the case of material, the simpler plan would be to make light

frames put together with halved joints, and stretching the material over this. In the lower panels it would be advisable to fit three rails, as otherwise the material would tend to pull in the sides. Allow a very easy fit, a clearance of about ⅛ in. all round is advisable, because this will allow the material to be turned over at the edges; this allows for the tacks, too.

Before tacking on the material it is as well to fix stout brown paper across the frames. This prevents the cloth from being pressed in easily if touched. Damp the paper and glue on at both sides. As it dries out it will become taut. Fix the material with tacks, turning over at the edges.

CUTTING LIST

	Length.	Width.	Thickness.
6 Stiles . . .	5 ft. 6 in.	1¾ in.	1 in.
3 Rails . . .	1 „ 3½ „	4½ „	1 „
3 „ . . .	1 „ 3½ „	3¼ „	1 „
3 „ . . .	1 „ 3½ „	2¾ „	1 „
Panel frames :			
6 Stiles . . .	1 „ 4½ „	2¼ „	⅜ „
6 „ . . .	3 „ 5 „	2¼ „	⅜ „
15 Rails . .	1 „ 1½ „	2¼ „	⅜ „
Mouldings and beads extra.			

STANDARD LAMP

One of the difficulties with which the home wood-worker is faced when making a standard lamp is that of making the hole for the flex. In the present example, Fig. 231, this is overcome by building up the standard rather in the form of a long box as shown in Fig. 232. This is jointed to an upper base, and beneath this is screwed the base proper.

The parts for the standard are prepared first from ½-in. stuff. Since they are butted together, two pieces 2 in.

wide and two pieces 1 in. wide are required. Both taper towards the top, the former to $1\frac{1}{2}$ in., and the latter to $\frac{1}{2}$ in.

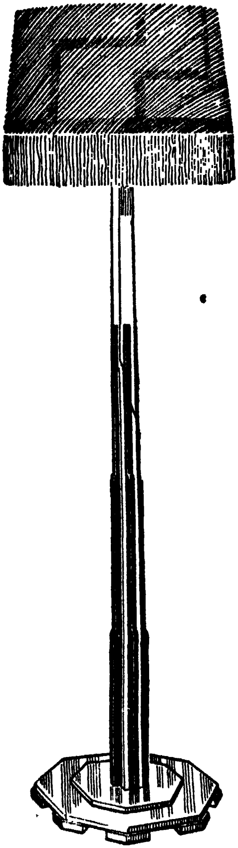


FIG. 231.—STANDARD LAMP.
The buttressed sides are ebonised.

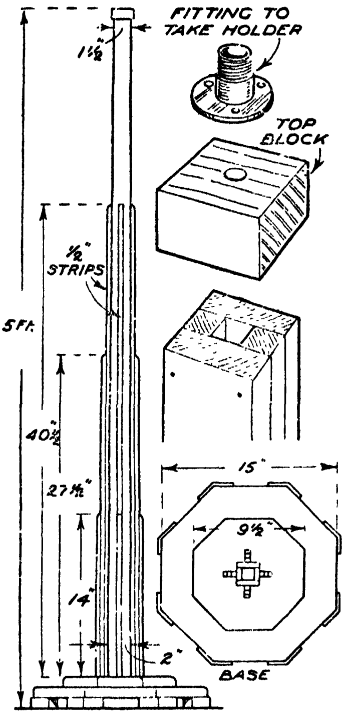


FIG. 232.—ELEVATION AND PLAN.
Also construction details.

Prepare them first with their sides parallel and cut off both ends perfectly square, allowing sufficient length at the bottom for the tenon which passes through the upper base. They can then be tapered, half from each side. Put them together with glue and nails. At the

bottom the end is plugged to the extent of about 4 in. (see block in Fig. 233). When the glue has set, level the joints and trim the bottom and top ends. Set a gauge to the thickness of the upper base ($\frac{7}{8}$ in.) and mark round the lower end to form the shoulder. By cutting across the grain to a depth of $\frac{1}{8}$ in. and chiselling away the waste, a tenon is formed as in Fig. 233.

Across the end a couple of saw-cuts are made to enable wedges to be driven in later. These run across the wide sides, not the short ones, as otherwise the joints might split.

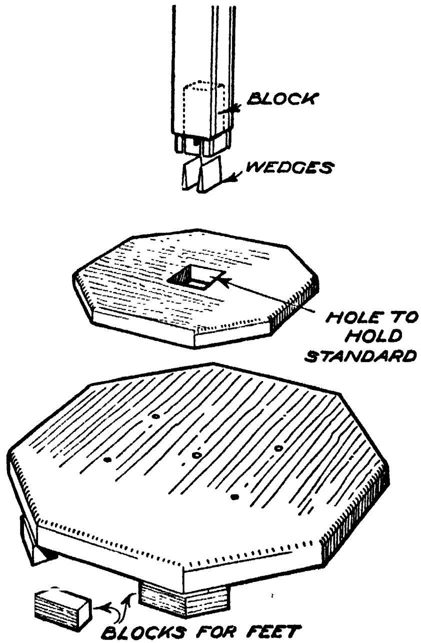


FIG. 233.—LOWER BASE DETAILS.

The upper base is $9\frac{1}{2}$ in. square, and the corners are cut off to form an octagon. In the centre a square hole is cut to take the tenon of the standard (Fig. 233), and the top edges are rounded over. Glue the standard in position and drive in the wedges (these are also glued). Note that these wedges run *across* the grain of the upper base. The lower base is made similarly to the other and is screwed on. Through the centre a hole is bored upwards right through the block.

The buttress pieces are simply $\frac{1}{2}$-in. strips glued and

nailed on as in Fig. 231. The upper ends are rounded, and they should be stained dark before fixing, unless a dark wood is used. For the feet little blocks of wood are mitred and fixed at each angle of the base (Fig. 233). Before fixing the top block it is advisable to pass through the flex, as otherwise it may be difficult to thread it through. The block is glued and nailed on. It has a hole through it for the flex as in Fig. 232, and a special metal fitting to take the lamp-holder is screwed on top. The holder should be of the type with switch incorporated in it.

CUTTING LIST
(FIG. 231)

	Length.	Width.	Thickness.
2 Standard pieces .	4 ft. 10 in.	$2\frac{1}{8}$ in.	$\frac{1}{2}$ in.
2 " " .	4 " 10 "	$1\frac{1}{8}$ "	$\frac{1}{2}$ "
4 Buttress " .	3 " 5 "	$\frac{1}{2}$ "	$\frac{1}{2}$ "
4 " " .	2 " 4 "	$\frac{1}{2}$ "	$\frac{1}{2}$ "
4 " " .	1 " $2\frac{1}{2}$ "	$\frac{1}{2}$ "	$\frac{1}{2}$ "
1 Top block . .	$2\frac{1}{8}$ in.	$2\frac{1}{8}$ "	$\frac{7}{8}$ "
1 Block . . .	4 "	$1\frac{1}{8}$ "	1 "
1 Upper base .	$9\frac{3}{4}$ "	$9\frac{5}{8}$ "	$\frac{7}{8}$ "
1 Base . . .	1 ft. $3\frac{1}{4}$ in.	$15\frac{1}{8}$ "	$\frac{7}{8}$ "
16 Feet . .	2 in.	$1\frac{1}{4}$ "	$\frac{3}{4}$ "
1 Lamp-holder with switch and fitting for same.			

USEFUL OCCASIONAL TABLE

This table should prove handy in the living-room. Apart from the utility point of view, it has been designed specially for simplicity of construction. The necessity for making mortise and tenon joints is obviated by forming the legs of two pieces joined together L fashion. In this way the top blocks *A*, Fig. 235, can be fixed with screws, and these blocks require only screws for joining them to the top. The shelf can be fixed direct with screws.

Make up the four legs first, each from two pieces, of

which one is $1\frac{3}{4}$ in. wide and the other $1\frac{1}{4}$ in. wide. They are $\frac{1}{2}$ in. thick. Place the edges true, and shoot the edge of each narrow piece so that it makes a nice joint with the flat of the adjoining piece. If the joints are well made, they require only to be glued and rubbed. Nails can be used if necessary, though it is better to

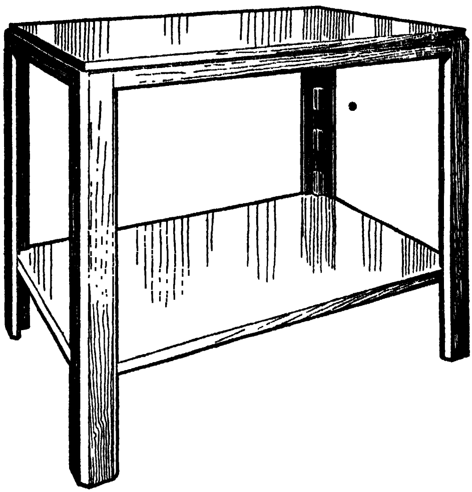


FIG. 234.—USEFUL OCCASIONAL TABLE.
The legs are made with strips and are put together L fashion.

avoid them. If they are used, they should be punched well in so that the plane does not foul them when the corner chamfer is worked.

When the glue has set, trim any inequalities at top and bottom and rub in the glue blocks shown in Figs. 235 and 236. Note two of them are placed immediately above and below the shelf, and it is better if these two are added later. Mark in the position of the shelf at the inner sides. Chamfers are worked on three corners as shown in the plan in Fig. 235.

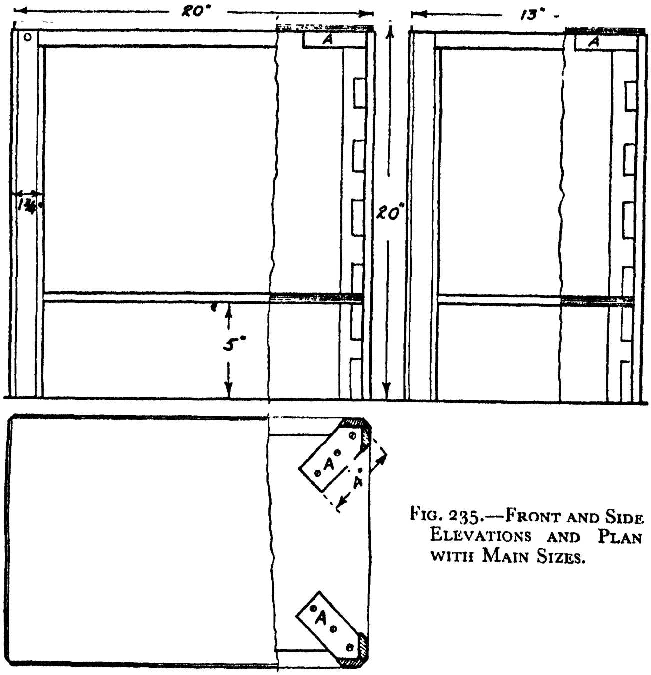


FIG. 235.—FRONT AND SIDE ELEVATIONS AND PLAN WITH MAIN SIZES.

Next proceed with the top, making it to finish 19¾ in. by 12¾ in. Plywood ½ in. thick should be used. A lipping ⅛ in. thick is added all round to hide the layers. As the

CUTTING LIST

	Length.	Width.	Thickness.
1 Top . . .	20 in.	13 in.	½-in. ply
1 Shelf . . .	19½ ,,	12½ ,,	½ ,,
4 Legs . . .	20 ,,	1⅞ ,,	½ in.
4 ,, . . .	20 ,,	1⅜ ,,	½ ,,
2 Rails . . .	18 ,,	⅞ ,,	⅞ ,,
2 ,, . . .	11 ,,	⅞ ,,	⅞ ,,
4 Blocks *A* . .	4⅛ ,,	2 ,,	⅞ ,,

Lipping and glue blocks extra.

top stands in $\frac{1}{8}$ in. from the legs, the shelf should finish $19\frac{1}{4}$ in. by $12\frac{1}{4}$ in. The lipping is added later. It thus fits level with the inside surfaces of the legs. The top blocks, *A*, Figs. 235 and 236, can be cut out and fixed with screws. It is advisable to glue them. The screws are recessed and the holes plugged—Fig. 236.

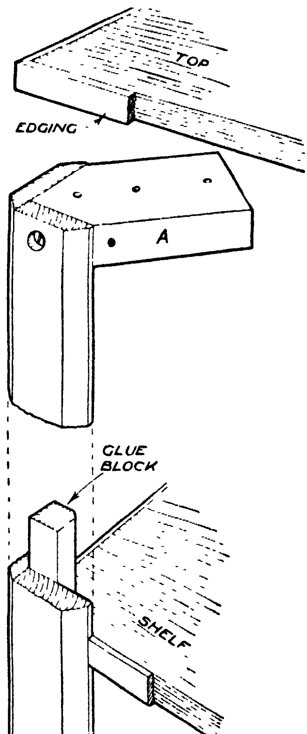


FIG. 236.—GENERAL DETAILS OF CONSTRUCTION.

The whole is now ready for assembling. Fix the legs to the shelf with screws, recessing the last-named and plugging the holes. Care has to be taken when screwing the shelf to avoid separating the layers of the ply. Next screw the blocks *A* to the top. Remember that the top stands in all round. The lipping to the shelf follows (see Fig. 236), and the remaining glue blocks are rubbed in. The four rails are also added under the top. The ends are cut at an angle.

SMALL BOOK-TABLE

A very simple piece of woodwork without any complicated joints is shown at *A*, Fig. 237. It should prove handy to stand by the chair-side in the living-room. It is designed so that it can be used from both sides, the top being arranged so that books can be slid in either side.

The lower shelf is handy for magazines and papers. Practically any hardwood could be used, and it is suggested that the plinth be stained a darker shade than the rest. *B* gives the chief sizes, and *C* shows how the parts are joined together.

It will be noticed that the top stands in a trifle and is rounded over. It fits in lapped joints cut in the sides, and these are shown clearly at *C* and *D*. This means that the top must be cut short of the over-all length by the thickness of the laps. This might be $\frac{3}{16}$ in., making $\frac{3}{8}$ in. in all. The same thing applies to the bottom, though this does not project downwards, but finishes flush.

Prepare the two sides from $\frac{5}{8}$-in. stuff to finish $16\frac{3}{4}$ in. by 18 in. Plane the edges square and mark out with the gauge the lapped joints. The lap thickness can be $\frac{3}{16}$ in., and the depth at the top is $\frac{3}{8}$ in., allowing the rounded edge of the top to stand up $\frac{1}{4}$ in. At the bottom the depth is $\frac{5}{8}$ in. Cut the joints by sawing across the grain and chiselling away the waste. A rebate plane is handy with which to finish off. The four parts are put together with glue and nails, the last named being punched in and the holes filled up with plastic wood.

Beneath the top a rail is fixed as shown by the dotted lines at *C*. It can also be seen at *D*. It is screwed to the top from beneath. Other pieces running from front to back can also be glued in as shown. These are really glue blocks. They are cut up into lengths of about $1\frac{1}{2}$ in., each with about $\frac{1}{16}$ in. gap between so that they do not oppose shrinkage. Fillets are fixed to hold the shelf as at *C*. In the centre of the shelf is a rail 1 in. high to prevent books from being pushed too far in. It is screwed from underneath.

A simple way of making the plinth is merely to butt the corners, glueing and nailing them. Glue blocks in the corners strengthen them. To fix the plinth, the table is

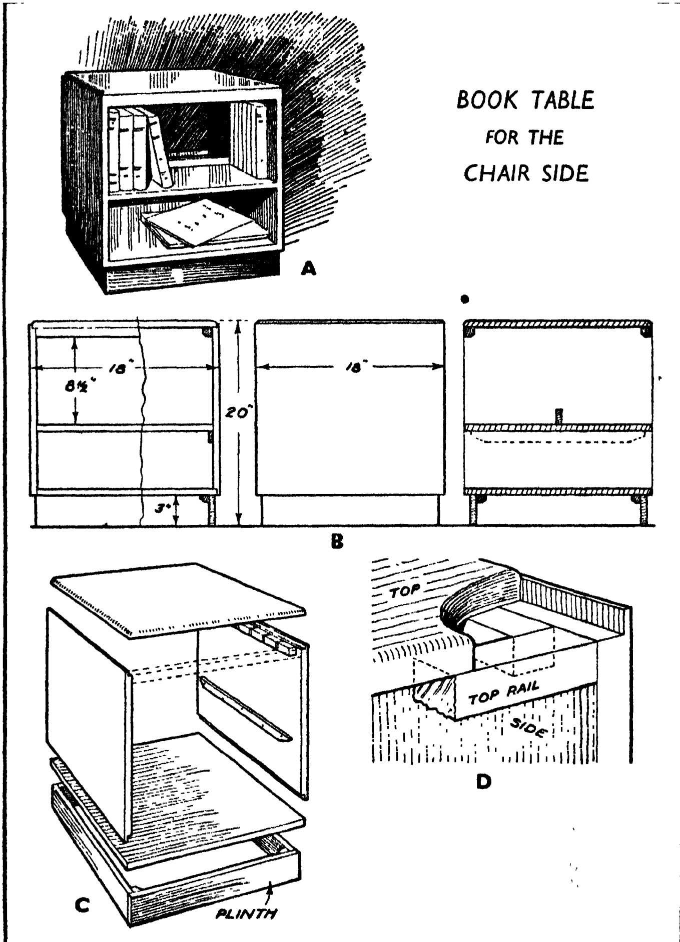


FIG. 237.—ATTRACTIVE SMALL BOOK TABLE FOR THE CHAIR SIDE.

A. The completed table. *B.* Elevations with sizes.
C. How the carcase is made. *D.* Detail of top construction.

turned upside down and the plinth placed in position. A couple of nails are driven in askew to hold it. Glue blocks are then rubbed in all round as shown in the section at *B*.

CUTTING LIST

	Length.	Width.	Thickness.
2 Sides . . .	17 in.	$18\frac{1}{8}$ in.	$\frac{5}{8}$ in.
1 Top . . .	$17\frac{7}{8}$,,	$18\frac{1}{8}$,,	$\frac{5}{8}$,,
1 Bottom . .	$17\frac{7}{8}$,,	$18\frac{1}{8}$,,	$\frac{5}{8}$,,
1 Shelf . . .	17 ,,	$18\frac{1}{8}$,,	$\frac{5}{8}$,,
1 Shelf rail . .	17 ,,	$1\frac{1}{8}$,,	$\frac{3}{8}$,,
2 Top rails . .	17 ,,	1 ,,	1 ,,
4 Plinth pieces .	$17\frac{3}{4}$,,	$3\frac{1}{8}$,,	$\frac{5}{8}$,,
2 Fillets . . .	$17\frac{1}{4}$,,	1 ,,	$\frac{3}{8}$,,
Glue blocks are extra			

CIRCULAR COFFEE-TABLE WITH SHELF

This table is intended to be made with a thick plywood top and shelf, and under-framing of solid oak. A 24-in. square of oak-veneered plywood can be used for the top, the edges being covered with a $\frac{1}{8}$-in. strip of oak bent round. It is best, if the reader is able to do so, to have the circular shape cut out on a band-saw. Failing this, the bow-saw will have to be used, in which case care must be taken not to split away the back layer of the ply. The best way of marking the shape is to prepare a strip of wood just over 12 in. long. A small notch is cut in one end, and a fine nail driven right through $11\frac{7}{8}$ in. from it. By using the nail as a centre and placing a pencil in the notch, the circle can be drawn in. Do not drive the nail into the top, but into a small block of wood fixed temporarily to it. Note that the size of $11\frac{7}{8}$ in. is given to allow for the $\frac{1}{8}$-in. edging. The shelf is marked out in the same way.

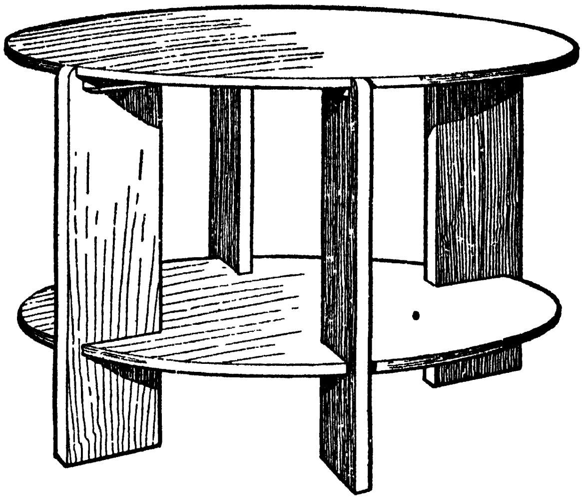


FIG. 238.—SIMPLE COFFEE TABLE.
Showing plywood top and shelf, and solid uprights.

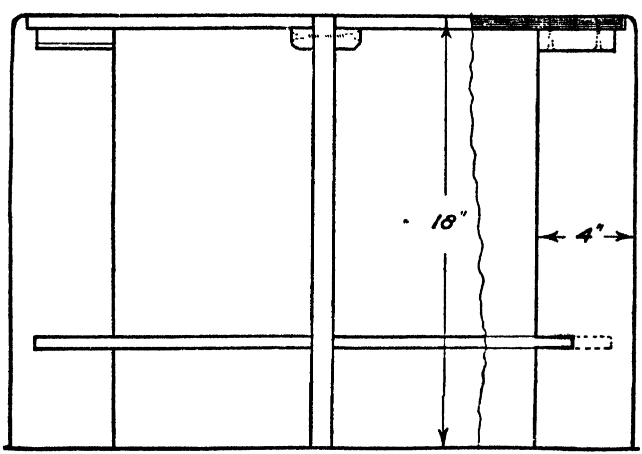


FIG. 239.—ELEVATION WITH SIZES.

Clean up the edges with the smoothing-plane or spoke-shave, and fix on the edging. It will bend easily, and is held down with glue and fine nails. The ends can be

CUTTING LIST

	Length.	Width.	Thickness.
1 Top . . .	24 in.	24 in.	$\frac{1}{2}$-in. ply
1 Shelf . . .	23 ,,	23 ,,	$\frac{1}{2}$,,
4 Uprights . .	$18\frac{1}{2}$,,	$4\frac{1}{8}$,,	$\frac{7}{8}$ in.
8 Blocks . .	$3\frac{1}{2}$,,	$\frac{7}{8}$,,	$\frac{7}{8}$,,

either butted or cut off at an angle. When dry, the edges can be levelled and the whole thing cleaned up. It is as well if the edging overlaps a trifle, to allow for cleaning off.

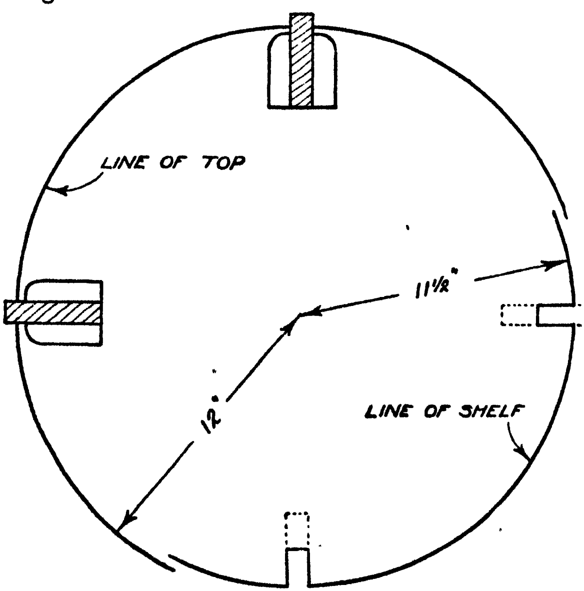


FIG. 240.—PLAN SHOWING LEG POSITIONS.

Both pieces are marked out by drawing centre lines at right angles. Details of the joints are given in Fig. 241. Under the top blocks of wood are screwed to both the top and the uprights. It is sufficient if the positions of the uprights are marked under the top. The shelf, however, has halved joints. As the uprights extend into the shelf to the extent of 3 in., the halving is cut in to a depth of 1½ in. Draw in the joint parallel with the centre lines, and cut away the waste with the saw and chisel.

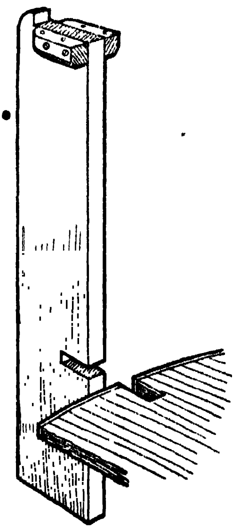


FIG. 241.—HOW TOP AND SHELF ARE FIXED TO LEGS.

Now proceed with the uprights. They measure 18 in. by 4 in. by ⅞ in., and the halved joints are cut in 4 in. from the bottom. These again are 1½ in. deep. At the top the wood is cut away as in Figs. 239 and 241, to allow the top to drop in. This leaves a projection ½ in. square, and the outer corner of this is rounded over as shown. Prepare the fixing-blocks and screw them on, one each side. Place the holes so that the screws do not foul each other in the thickness of the wood. Two additional holes are needed in each for fixing to the top.

The whole thing is now ready for assembling. Glue in the legs to the shelf and drive in a couple of nails at each joint. These nails can be driven in askew from underneath, so that they do not show. The top is laid face downwards on the bench and the framework placed upon it. Make sure that the legs coincide with the pencil marks, and drive in the screws.

Cocktail Cabinet

This is a piece of furniture that is becoming increasingly popular. The size of 2 ft. wide by 3 ft. 6 in. high is handy for the small house. It is large enough to give reasonable accommodation without taking up a great deal of space. That shown in Fig. 242 is intended to be made in solid

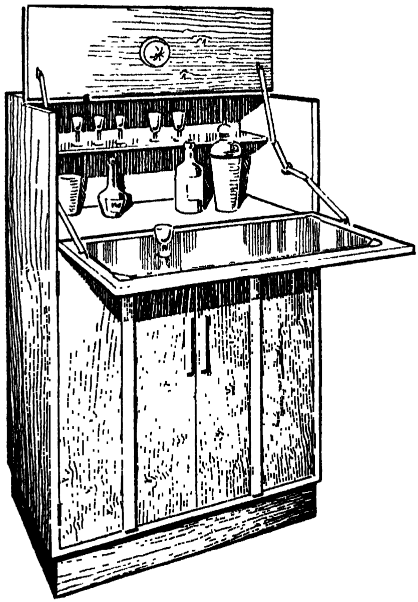


Fig. 242.—Oak Cocktail Cabinet.
With useful cupboard space beneath.

wood, though laminated board or thick plywood could be used for the lid, fall, and doors if desired. If well-seasoned solid wood is used, however, it will prove quite satisfactory.

Fig. 243 gives the main sizes, and Fig. 244 the general construction. Quite simple joints of the lapped type are

suggested, though more skilled readers could substitute lapped or double-lapped dovetails. The fittings can be obtained in sets. The two struts are of the automatic type, which lower the fall as the lid is raised. It is advisable to obtain these struts first, because the size varies with different sizes of cabinets.

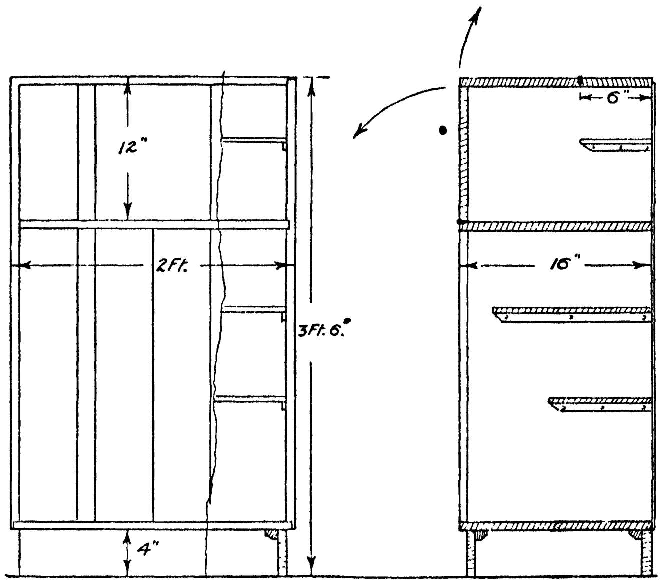


FIG. 243.—FRONT AND SIDE ELEVATIONS WITH CHIEF SIZES.

The main carcase consists of the two sides, top, shelf, and bottom. The remaining parts are added later. Notice from Fig. 244 that the top edges of the sides are cut down at the front to allow the lid to fit flush on top. As, however, the top is lap-jointed to the sides, the depth of the cut-down portion must be reduced by an amount equal to the thickness of the lap. As $\frac{3}{4}$-in. stuff is used throughout, the lap might conveniently be $\frac{3}{16}$ in. Thus

the length of the sides is 3 ft. 2 in. less $\frac{3}{16}$ in.—that is, 3 ft. $1\frac{13}{16}$ in.—and the cut-down portion is $\frac{9}{16}$ in. deep. Prepare the two sides square first, and make sure that they are exactly alike. If placed together and the fingers run round the edges, it is easy to test this. The cut-down part can be gauged in and sawn away.

The shelf fits in grooves, and the positions of these

CUTTING LIST

	Length.	Width.	Thickness.
2 Sides . . .	3 ft. $2\frac{1}{4}$ in.	$16\frac{1}{8}$ in.	$\frac{3}{4}$ in.
1 Top . . .	2 ,, $\frac{1}{4}$,,	$6\frac{1}{8}$,,	$\frac{3}{4}$,,
1 Shelf . . .	1 ,, $11\frac{3}{8}$,,	$16\frac{1}{8}$,,	$\frac{3}{4}$,,
1 Bottom . .	2 ft.	$16\frac{1}{8}$,,	$\frac{3}{4}$,,
2 Doors . .	2 ft. 1 in.	$11\frac{1}{2}$,,	$\frac{3}{4}$,,
1 Fall . . .	1 ,, $10\frac{3}{4}$,,	$11\frac{3}{8}$,,	$\frac{3}{4}$,,
1 Lid . . .	2 ,, $\frac{1}{4}$,,	$10\frac{1}{8}$,,	$\frac{3}{4}$,,
2 Strips . . .	$11\frac{1}{2}$ in.	$1\frac{5}{8}$,,	$\frac{1}{8}$,,
2 ,, . . .	2 ft. 1 in.	$1\frac{5}{8}$,,	$\frac{1}{8}$,,
1 Shelf . . .	1 ,, $10\frac{3}{4}$,,	14 ,,	$\frac{1}{2}$,,
1 ,, . . .	1 ,, $10\frac{3}{4}$,,	9 ,,	$\frac{1}{2}$,,
2 Plinth pieces .	1 ,, 11 ,,	$4\frac{1}{8}$,,	$\frac{3}{4}$,,
2 ,, ,, .	1 ,, 4 ,,	$4\frac{1}{8}$,,	$\frac{3}{4}$,,
1 Back . . .	3 ,, 2 ,,	2 ft.	$\frac{3}{16}$-in. ply

Fillets and glue blocks are also needed.
Glass shelf and glass lining.
4 Pairs $1\frac{1}{2}$-in. brass butt hinges.
2 Automatic stays.
1 Lock, 1 bolt.

should be squared across the edges of both sides so that they are exactly alike. The grooves are stopped at the front to give a neat finish. They can be $\frac{5}{16}$ in. deep, and the sides can be sawn in, and the waste removed partly with the chisel and finished with the router. To simplify the sawing, a recess can be chopped at the front against the stop. This allows the front of the saw to run out. At the bottom a lapped joint is made. This should be gauged in, and the waste removed by sawing across the

grain and then chopping out with the chisel at the end. A rebate plane is handy to finish off.

We come now to the other pieces. The top runs right through, and is lapped at the ends to fit over the sides. As already mentioned, the lap is $\frac{3}{16}$ in. thick. As the

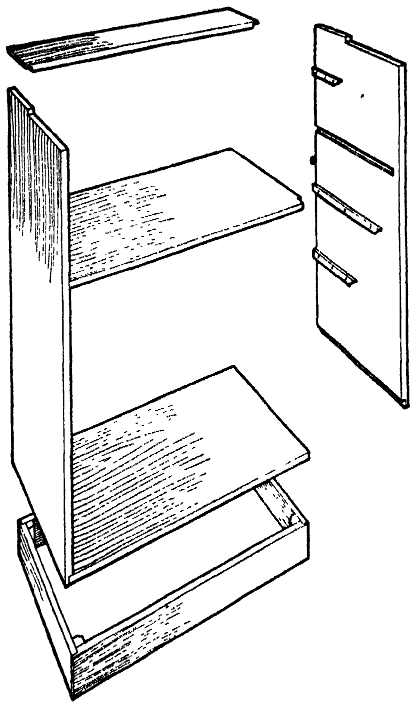


FIG. 244.—METHOD OF MAKING THE MAIN CARCASE.

grooves for the shelf are $\frac{5}{16}$ in. deep, the over-all length of the shelf is 1 ft. $11\frac{1}{8}$ in. The bottom is short of the over-all size by the combined thickness of the two laps. This could be $\frac{3}{16}$ in. each, making a length of 1 ft. $11\frac{5}{8}$ in.

The carcase can now be assembled. First glue and

nail the bottom to the sides, driving in the nails dovetail fashion to give maximum strength. The top follows, and is fixed similarly, the nails being driven through the sides into the top. Use nails with small heads and punch them in, filling in the holes with plastic wood. The shelf can be slid in from the back. Fix on a cramp and drive in nails at an angle beneath the shelf into the sides. In this way the nails will not show at the outside. Test for squareness, and put aside for the glue to set.

When the joints have been levelled, the plinth can be made. The corners have simple lapped joints as shown in Fig. 244, and they are put together with glue and nails. Note that it stands in from the carcase $\frac{5}{8}$ in. at front and sides. It can be strengthened considerably by the addition of glue blocks in the corners. To fix it, it can be glued and a few nails driven in downwards through the bottom. Glue blocks rubbed in at the inner corners make it thoroughly secure (see section in Fig. 243).

For the doors two pieces of sound hardwood can be used. If plywood is preferred, it is advisable to lip the edges, so that the thicknesses are concealed. Make a neat fit and add the centre strips. These can be $1\frac{1}{2}$ in. wide by $\frac{1}{8}$ in. thick. They are hung with a pair of butt hinges each, these being let wholly into the doors. A stop should be fixed beneath the shelf to prevent the doors from being pushed in too far. A bolt is fixed to the left-hand door and a lock to the other. Alternatively, plain ball catches can be fitted. For the handles plain strips about $\frac{5}{8}$ in. square in section are used. The front can be rounded a trifle. Screws driven into them through the doors serve to hold them.

Fig. 245 shows how the lid and fall are hinged. The strips are fixed across the fall to line up with those on the doors. A little experiment may be required to find the exact position for the stay. The centre rounded portion should be about 5 in. above the shelf. A bright

effect is produced by fitting a mirror to the inside of the fall. A piece of thick brown paper should be laid beneath it and metal corner-clips used to fix it. If desired, another sheet of glass can be fixed at the back of the upper portion.

The shelf for glasses can be of plate glass supported

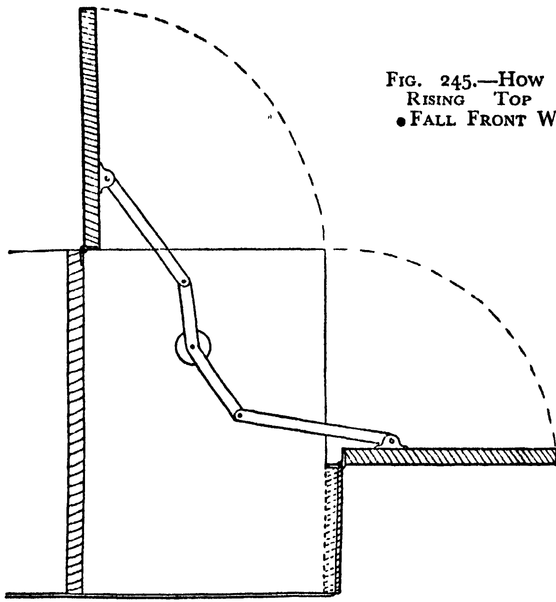


FIG. 245.—HOW THE RISING TOP AND FALL FRONT WORK.

by wood fillets fixed to the sides. The lower shelves are of wood, and are held similarly. For the back of the cabinet a piece of $\frac{3}{16}$-in. plywood can be screwed on.

LOUNGE FIRESIDE CHAIR

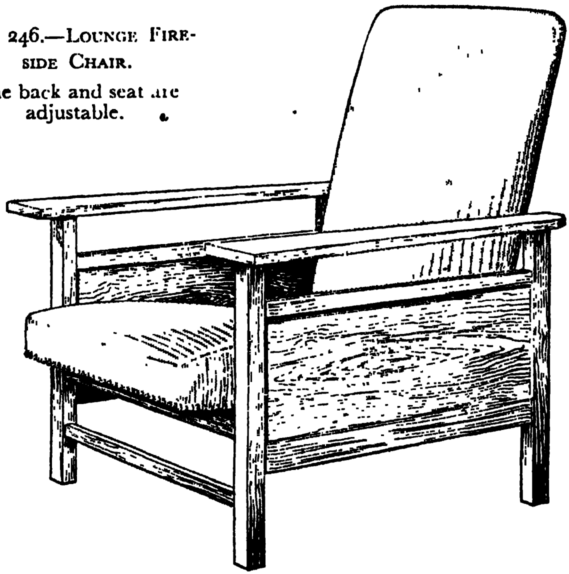
WITH ADJUSTABLE SEAT AND BACK

An adjustable armchair of this type does not call for any heavy cost in timber. It is comparatively simple to

construct, and if the reader is not experienced in upholstery, this part of the work can be had done locally at a small cost. Oak is the obvious choice in wood.

The chair is really in two separate parts: the general framework as at Fig. 253 and the seat and back, which are hinged together. The adjustment (as seen from Fig. 247)

FIG. 246.—LOUNGE FIRESIDE CHAIR.
The back and seat are adjustable.



is quite simple. When the seat-front is practically flush with the legs, the back is almost straight. As the seat is pulled forward, the slope of the back increases. Dowel-pins, spaced to engage the front rail (*F*), hold it securely in position.

CHAIR FRAME

The legs may be finished to $1\frac{3}{4}$ in. or $1\frac{5}{8}$ in. square. At the top cut a stub tenon to enter the arm, and mark

carefully for the tenons of the various rails. Note that the side rails do not correspond with those of the front and back. First complete the two sides, tenoning in the rails (*B* and *C*). These rails will be grooved to take the plywood panels (*D*). As there is no strain on these panels they might, instead, be beaded in with $\frac{1}{4}$-in.

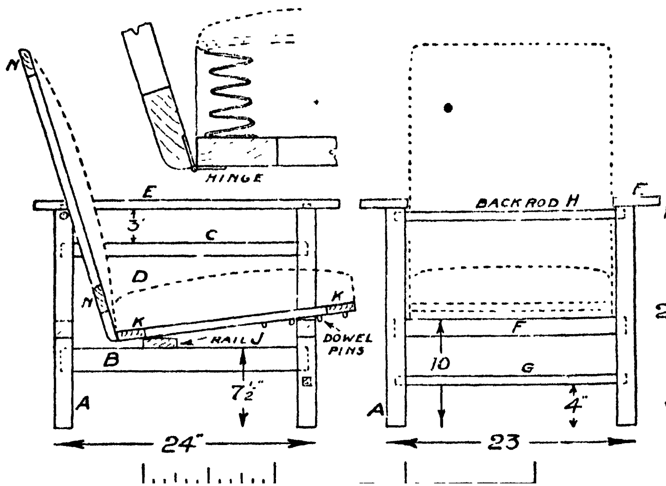


FIG. 247.—END SECTIONAL VIEW. FIG. 248.—FRONT VIEW.

FIG. 249 (above).—HOW SEAT IS HINGED TO BACK.

quarter-round bead moulding. The arms (*E*) may, if found more convenient, be fitted at a later stage.

The two sides when completed are connected by the front rails (*F* and *G*) and the back rails (*F* and *H*). The two rails (*F*) are kept the full thickness of the legs ($1\frac{3}{4}$ in. or $1\frac{5}{8}$ in.) and should be $1\frac{3}{4}$ in. wide. The front stretcher rail (*G*) may be $1\frac{1}{8}$ in. by $\frac{3}{4}$ in., whilst the top back rail (*H*, which supports the adjustable back) is a rod of $\frac{7}{8}$ in. diameter entered firmly into the legs as near the

top as boring will permit. The tenons on the seat rails (*F*) should be entered well home, as they do not foul the tenons on the side rails.

Resting on the side rails (*B*) is a mid-cross rail (*J*), which, as seen from Fig. 247, supports the seat frame. Its approximate position may be taken from the scale, but it should be fitted loose until the seat and back frames are assembled. It must fit tightly between the plywood

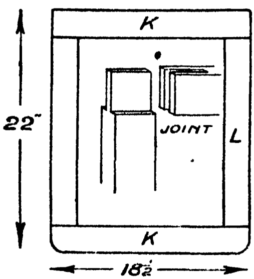


FIG. 250.—SEAT FRAME.

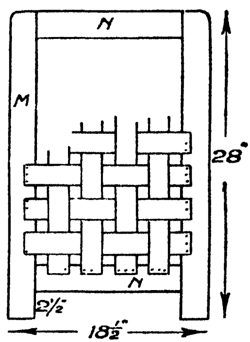


FIG. 251.—BACK FRAME.

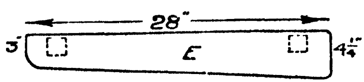


FIG. 252.—ARM.

panels, and, in addition to screwing, may be held with angle repair plates underneath, screwed to rails (*B*). The upper face of this rail may be slightly rounded to facilitate the smooth running of the seat frame.

SEAT AND BACK

The seat (Fig. 250) and back (Fig. 251) frames are of stuff 2½ in. by ⅞ in., mortised and tenoned together. Note that the stiles (*M*) of the back project 2½ in. at the foot.

The framing of the seat is rounded at the front and that of the back at the top. The two frames are hinged together (see upper diagram, Fig. 249) with wide back-flap hinges. Hardwood dowel-pegs are fitted to the

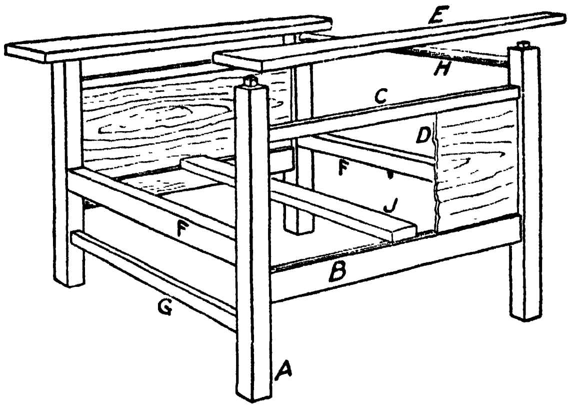


FIG. 253.—CONSTRUCTION OF CHAIR FRAME.

underside of the seat frame at each side. These are spaced a full 1¾ in. apart, so that they engage the front rail (*F*). As already indicated, the pulling forward

CUTTING LIST

	Length.	Width.	Thickness.
(*A*) 4 Legs .		1¾	1¾ in.
(*B*) 2 Rails .	24	2¼	⅞ or 1⅛ in.
(*C*) 2 ,, .	24	1⅛	⅞ or 1⅛ ,,
(*D*) 2 Panels .	21½	9½	¼-in. ply
(*E*) 2 Arms .	29	4½	⅞ in.
(*F*) 2 Rails .	23	1¾	1¾
(*G*) 1 Rail .	23	1⅛	
(*H*) 1 Rod .	23	⅞	
(*J*) 1 Rail .	22	2½	
(*K*) 2 Seat stiles	19	2½	
(*L*) 2 Rails .	23	2½	
(*M*) 2 Back stiles	29	2½	
(*N*) 2 Rails .	19	2½	

(or pushing back) of the seat automatically adjusts the slope of the back. Sometimes the top back rod (*H*) is omitted and short hardwood or stout brass pegs are substituted. The rod, however, helps to stiffen the framework. The seat and back will be webbed as at Fig. 251. The seat only (not the back) is sprung. Coil springs of 4 in. will serve the purpose, but must be of stout gauge. They are tacked to the frame with staples and sewn to the webbing. For the seat edge it is usual to lash a $\frac{3}{8}$-in.-diameter flexible cane (all round) to the springs.

The timber required will be as on p. 271. The lengths given allow for joints and fitting, but all thicknesses are the net finished sizes.

CHAPTER IX

THE KITCHEN

Shelves and Fitments

Probably every householder is called upon to fit up a shelf or fitment at some time or other, and the suggestions given here are for what is likely to prove the most useful kind. Shelves can be of any wood, from cheap deal to oak, and it is in accordance with the particular purpose for which they are required that the choice is made. Deal in the cheapest grade is good enough for workshop or garage shelves, whilst for the scullery or living-room a better quality is desirable. Oak looks very well, especially when stained and wax-polished, but it is obviously more expensive.

In regard to thickness, except for quite small, light shelves, $\frac{7}{8}$ in. is the usual. It is reasonably free from sagging without looking heavy. The length, of course, affects the former consideration, and in the case of extra long shelves it is generally advisable to arrange for some form of centre support. A $\frac{7}{8}$-in. oak shelf could be up to 5 ft. long without any centre support, providing too great a weight were not placed upon it.

A length of 4 ft. is generally about the maximum length to which one of deal could be risked. If it should appear unduly heavy, the upper edge (in the case of a shelf above the eyeline) could be chamfered.

SINGLE SHELVES

The method of supporting the shelves is an important consideration, and this depends mainly upon the position in which the shelf is to be fixed. The simplest way is

when it can be fixed in a recess, supporting battens being nailed or screwed to the walls. This is shown in Fig. 254, in which a set of shelves suitable for the scullery or kitchen is fitted in a recess. For quite light items, or for comparatively short shelves, end battens alone are needed. A more satisfactory method, however, is to fit another batten along the back, as this helps to prevent sagging.

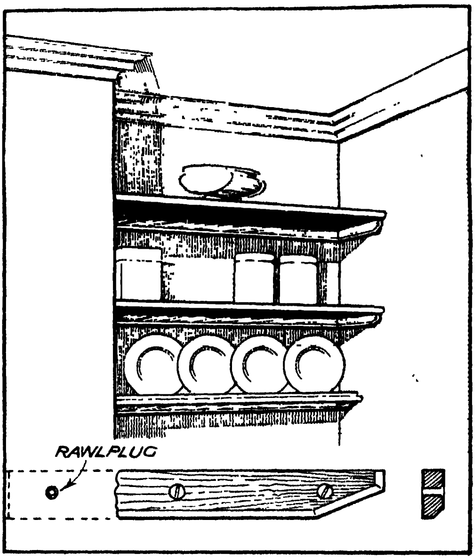


FIG. 254.—SHELVES FOR SCULLERY OR KITCHEN.

Note that the end battens are taken off at an angle at the front, and that all of them are chamfered at the lower edge. This gives a much neater appearance and takes off the heaviness.

METHODS OF FIXING

A good bearing in the walls is essential, and this is best obtained by using wooden plugs or Rawlplugs into

which screws can be driven. Occasionally nails can be driven into the mortar seams between the bricks, but these are usually concealed by a surface of plaster and are difficult to locate—in any case, they may not be in just the positions required. Nails cannot be driven into concrete walls, and although, in the case of a lath-and-plaster wall, the nails can sometimes be driven into the main wooden uprights, these again are usually concealed.

Altogether, then, plugs offer the best fixing, since they can be cut into nearly all kinds of walls, and can

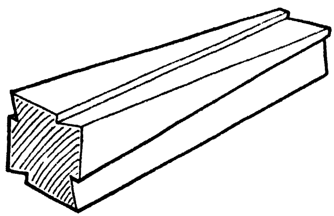


FIG. 255.—STRONG FORM OF WOODEN PLUG.

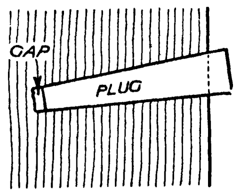


FIG. 256.—HOW SMALL GAP IS LEFT BEHIND PLUG.

be used just where required. One important point is that they should be driven in at an angle, so that they slope downwards. In this way the direct pull of the shelf is largely resisted. The best shape for a wooden plug is given in Fig. 255. It tapers slightly, and sloping grooves are cut on all four sides, these giving the plug a twisting movement as it is driven in.

The hole is cut with a small cold chisel, and the plug made so that when driven in, it bears tightly against the sides. This means that there must be a slight gap between the end of the plug and the bottom of the hole as shown in Fig. 256. The length is made a trifle full, so that it can be sawn off flush after being knocked home. Rawlplugs are convenient in use and are effective. A much smaller hole is needed, so that the walls are not

knocked about so much. A special tool can be obtained for making the holes.

It is obviously necessary for the shelves to be perfectly level, and to ensure this the position should be pencilled out on the walls. Generally it is sufficient if the height is measured up from the floor at each side. If the floor is out of truth, however, it is better to place a batten against the wall at the back, and put a spirit-level on top. A pencil drawn along the batten gives the true line. At the ends

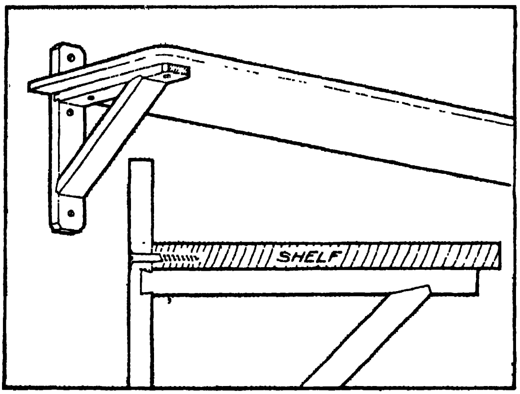


FIG. 257.—SELF-SUPPORTING FORM OF SHELF.
This is suitable for bearing heavy weights.

an ordinary bench square can be held in the angle to ensure the shelf being level from front to back.

In the case of a plate-shelf such as the bottom one in Fig. 254, some means of preventing the plates from sliding forwards has to be adopted. The most satisfactory way is to run a groove along the shelf. The plates fit in this, and the advantage is that a level surface is retained, so that other objects can be stood on the shelf. A simpler way is to nail a bead along the shelf.

SELF-SUPPORTING SHELVES

When there is no recess for the shelves, it is necessary to make them self-supporting. One very satisfactory way suitable for heavy weights is given in Fig. 257. Brackets are prepared and the shelves screwed to these. A strong hold is obtained if the horizontal member is dovetailed into the upright, because this joint resists the outward pull. The strut fits into sloping notches, and is either

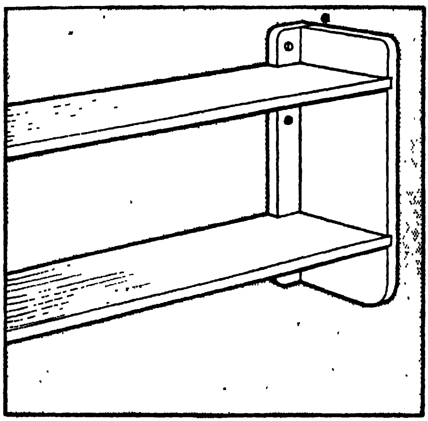


FIG. 258.—SHELVES WITH SOLID ENDS.

nailed or screwed. Note that the strain is taken by the joints themselves, the nails merely serving to hold them in position. It is strongly advisable to cut the shelves round the uprights, because there is then no gap at the back. The screw through the upright into the back of the shelf adds considerably to the strength, as this again helps to resist the downward pull. The whole thing is fixed up with screws driven through the upright into plugs. Note that it is the screws at the top which are the most important.

An alternative method is given in Fig. 258. Here the

shelves are fitted into grooves cut in solid end pieces rather in the form of a book-case. Note that back uprights are fitted. They provide a convenient means of fixing. The shelves are cut around them.

PLATE SHELF

An attractive plate-shelf is shown in Fig. 259. It is fixed immediately above the picture-rail, and makes a decorative feature in the room. The shaped brackets beneath are desirable to give additional support. They

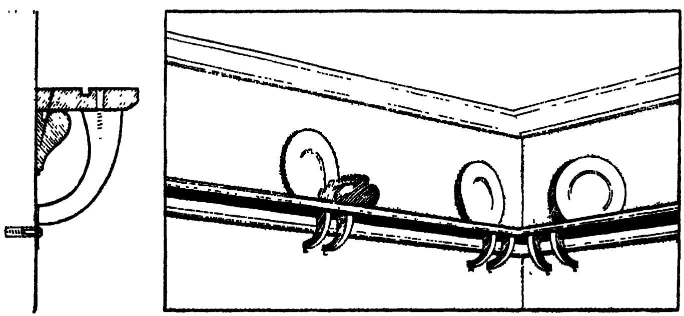


FIG. 259.—PLATE SHELF FIXED AROUND PICTURE RAIL.

can be fretted out of hardwood and be screwed through the shelf as shown. When fixing them, it is important that the lower edges are in line with the back edge of the shelf, so that they bear against the wall. Metal plates screwed to the ends give a means of fixing.

The shelf should be bevelled at the lower front edge, and a plate-groove is worked along the top. This is better than fixing a fillet, because it enables ornaments to be placed on the shelf. The whole thing is fixed with nails driven downwards into the picture-rail. The screws are driven through the metal plates afterwards. Such a shelf is quite satisfactory for light items such as plates.

Clothes-Airer

A dwarf clothes-airer may be either two-fold or three-fold, and anything from 3 ft. to 4 ft. high. The cutting list for each fold is:—

	Length.	Width.	Thickness.
2 Uprights . .	4 ft.	$1\frac{1}{8}$ in.	$\frac{7}{8}$ in.
3 Rails . . .	2 ft. 3 in.	1 ,,	$\frac{7}{8}$,,

The bottom rail may stand 12 in. from the floor, whilst the upright projects about 2 in. above the top rail. The top edge of each rail is comfortably rounded, and the tops of the uprights are also eased to roundness.

Two alternative types of rail are shown. That at *A* (Fig. 261) is $\frac{7}{8}$ in. thick and tenoned to the uprights. A simpler type is shown at *B*. Here the rail is only $\frac{3}{8}$ in. thick, with a flush shouldered tenon which will be wedged. If a hardwood is used, the $\frac{3}{8}$-in. thickness is sufficiently strong for an airer not exceeding 27 in. in width. As clothes-airers are subjected to damp and heat, it is wise to wedge all the tenons. Test carefully to see

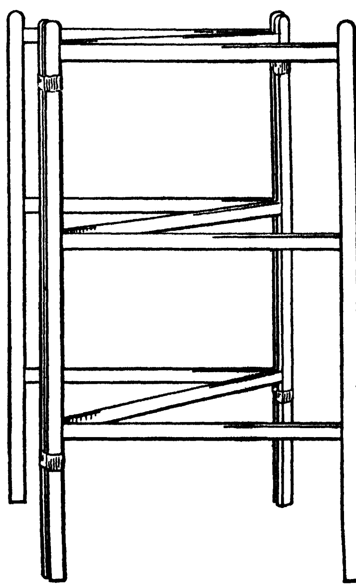


Fig. 260.—Simple 3-Fold Clothes-Airer.
If preferred it could be made with two folds only.

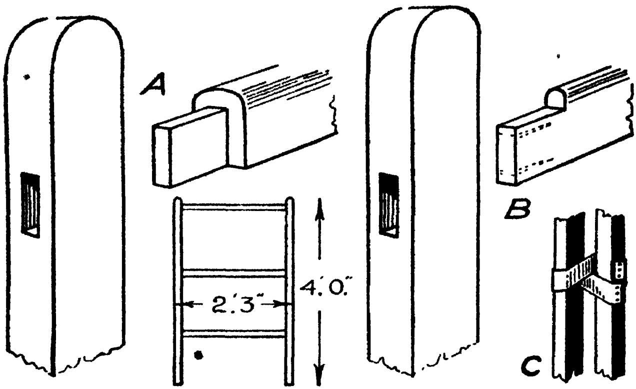


FIG 261.—DETAILS OF JOINTS AND SIZES OF CLOTHES-AIRER.

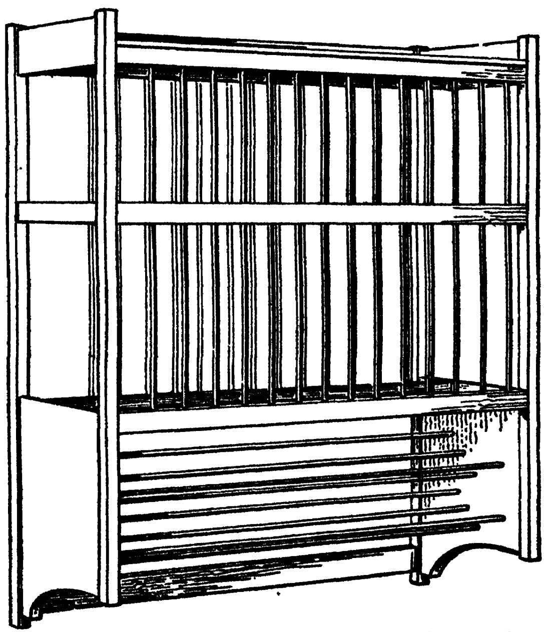


FIG. 262.—PLATE-DRAINING RACK OF HANDY SIZE.
Dowel rods ⅜ in. diameter are used for the smaller uprights and horizontals.

that the frames are not in winding after glueing up.

For the tape hinges (*C*) use stout tape from $1\frac{1}{2}$ in. to 2 in. wide. The simple method of fixing can be followed from the illustration. The tape is folded over where tacked.

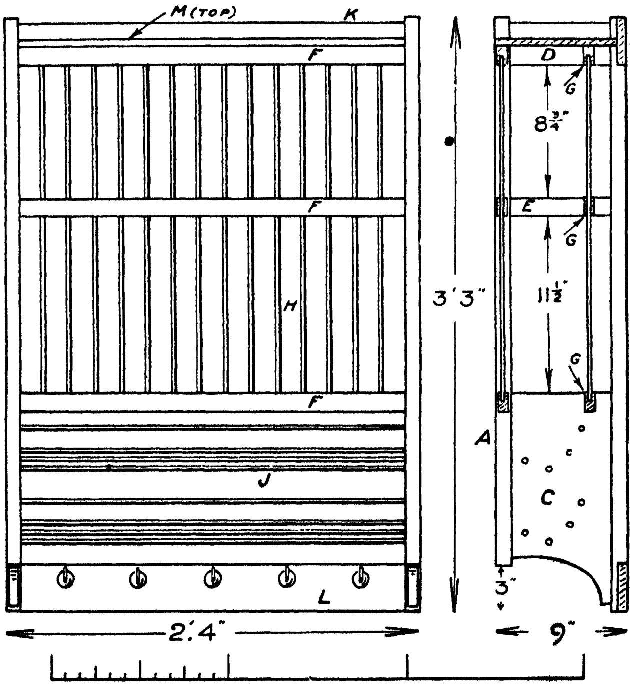


FIG. 263.—ELEVATIONS WITH SIZES OF DRAINING-RACK.

PLATE-DRAINING RACK

This plate-draining rack, Fig. 262, is of a useful size for the medium scullery, and is so planned that the width may easily be adjusted to fit the space available. The rack shown provides fifteen spaces for plates up to 11 in.

and 8 in. diameter respectively, and has two rows of dowelling for the accommodation of cups. There is a top shelf for miscellaneous articles, whilst chromium hooks for jugs may be screwed to the lower back rail.

The two ends are first prepared (Fig. 263). These consist of the front posts (*A*), the back posts (*B*), the shaped lower side (*C*), top rail (*D*) and mid rail (*E*). The shaped sides are housed, and the rails tenoned to the posts.

Before connecting the two ends, the two rows of upright dowelling should be framed up. Note that there are three rails (*F*) for the front row of dowels and three similar rails (*G*) for the back row. The back row will stand in about $2\frac{1}{2}$ in. to clear the wall, so that the lower plates can be accommodated without risk of tilting forwards. Cramp the six rails together and square off to length, allowing for the tenons. Space out for the dowel holes and square across so that the centres are uniformly marked on all six rails. The worker may please himself as to whether the two middle rails are bored right through to take each rod (*H*) in one long length, or whether he will bore separately for rods in two lengths. The dowel-rod is fitted dry, as the rails, when fixed, hold them in position.

The three front rails (*F*) are tenoned to the front posts (*A*), the three back ones are tenoned (see Fig. 263), one to the shaped sides (*C*), one to the top end rail (*D*), and the third to the mid end rail (*E*).

The horizontal dowel rods (*J*) fit into holes (about $\frac{3}{8}$ in. deep) bored to the shaped sides, whilst the top and bottom back rails (*K* and *L*) are dovetailed to the back posts. The top (*M*) is cut to fit around the posts and is screwed down.

The cutting list is as follows:—

	Length.	Width.	Thickness.
(*A*) Two front posts	3 ft.	$1\frac{1}{8}$ in.	$1\frac{1}{8}$ in.
(*B*) Two back "	3 ft. 3 in.	$1\frac{1}{8}$ "	$1\frac{1}{8}$ "
(*C*) Two shaped sides	1 " $2\frac{1}{2}$ "	8 "	$\frac{3}{4}$ "
(*D*) Two top end rails	9 in.	3 "	$\frac{7}{8}$ "
(*E*) Two mid " "	9 "	$1\frac{1}{4}$ "	$\frac{7}{8}$ "
(*F*) Three plate "	2 ft. 4 in.	$1\frac{1}{4}$ "	$\frac{7}{8}$ "
(*G*) " " "	2 " 4 "	$1\frac{1}{4}$ "	$\frac{7}{8}$ "
(*H*) Fourteen rods .	1 " 11 "	$\frac{3}{8}$ in. diameter	
(*J*) Eight " .	2 " 3 "	$\frac{3}{8}$ " "	
(*K*) Top back rail	2 " 4 "	3 in.	$\frac{3}{4}$ "
(*L*) Bottom " "	2 " 4 "	3 "	$\frac{5}{8}$ "
(*M*) Top . .	2 " 3 "	$8\frac{1}{2}$ "	$\frac{3}{8}$ "
The lengths allow for joints, but all thicknesses (for deal) are net.			

Folding Ironing-Table

For this, Fig. 264, a sound deal top board (*A*) of $\frac{3}{4}$ in. or $\frac{7}{8}$ in. is required, one end being pointed as shown and the edges gently rounded. At the square end (where

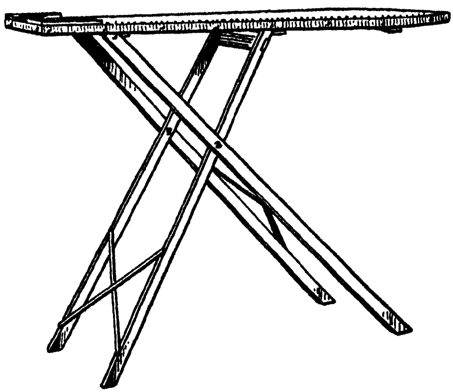


Fig. 264.—Simple Folding Ironing-Table.

the iron may rest) the board is covered with a sheet of asbestos, held down by $\frac{3}{8}$-in. by $\frac{1}{2}$-in. strips (*B*, Fig. 265). The board otherwise is covered first with a piece of old

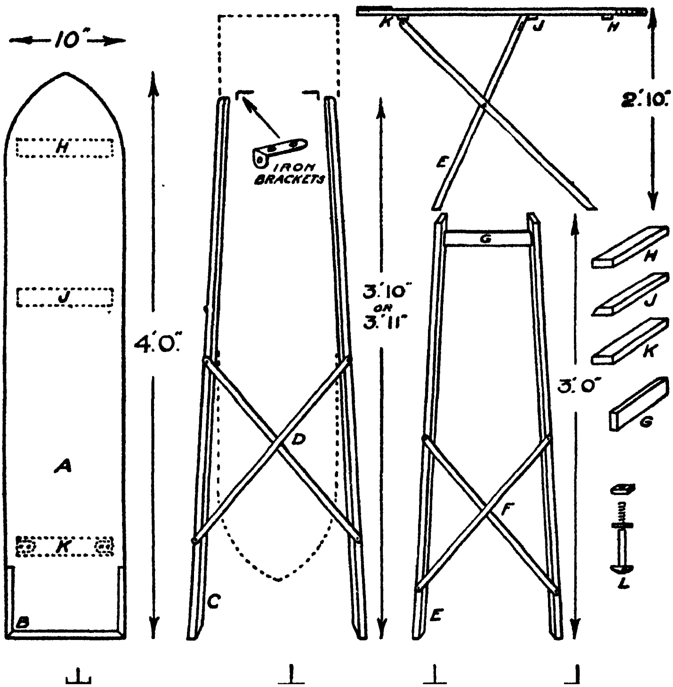


FIG. 265.—SIZES AND CONSTRUCTION OF IRONING-TABLE.

CUTTING LIST.

	Length.	Width.	Thickness.
A) Top board	4 ft. 0 in.		$\frac{3}{4}$ in.
B) Strip for ditto	2 ,, 0 ,		
Two legs	0 ,		
D) Two strips			
E) Two legs		$1\frac{1}{2}$	
Two strips	7 ,,	$\frac{5}{8}$	
Rail .	9 in.	$1\frac{1}{2}$	
, J, K) Three Battens . .		$1\frac{1}{2}$,,	

Lengths allow for joints, but widths and thicknesses are net.

blanket, and later with a piece of calico. The material is strained to fold over the edges and is neatly tacked, preferably with brass-headed nails.

The folding stand calls for two frames, one 3 ft. 10 in. or 3 ft. 11 in. long, the other 3 ft. long. The shorter frame is adjusted in width so that when pivoted with iron bolts it will fold within the legs of the longer frame. The sizes may be taken from the scale, but must be carefully tested in the actual making. The legs (*C* and *E*) may be of $1\frac{1}{2}$-in. by $\frac{7}{8}$-in. strips, whilst the cross bracing laths (*D* and *F*) may be $\frac{5}{8}$ in. by $\frac{3}{8}$ in., the strips being halved where they cross. The strips should be of hardwood.

The longer outer frame has a pair of small iron angle-brackets pivot-screwed to the inner faces of legs at top, these brackets being screwed later to the batten (*K*) under the top board. The shorter inner frame has a top rail (*G*) let into the legs and screwed. The exact point for pivoting the frames must be determined when assembling. The reader will find it of great help to make a working drawing of the elevation (see Fig. 265) to half size. When the height to table top (say, 2 ft. 10 in.) has been determined, he may then take two thin laths of the required length, lay these crosswise on the drawing, and adjust them till he gets them in the right position. The point for the pivot bolts is then struck, and the drawing can be completed. An important advantage of the drawing is that the correct bevels at the floor end of the legs and the bevel at the top of legs (*E*) may be marked.

In assembling, the importance of the battens (*J* and *K*) should not be overlooked. *K* is the batten to which the folding stand is hinged by means of the iron brackets, and should be of $\frac{7}{8}$-in. hardwood. The batten (*J*) acts as a stop for the shorter frame. The third batten (*H*) is

necessary to keep the top board out of winding, but has no connection with the folding frames. To secure the top board when the article is in use, it is well to screw a brass hook to the rail (*G*) of shorter frame, this to engage an eye screwed into the batten (*J*) against which the frame rests. The centre pivot bolts (*M*) may be

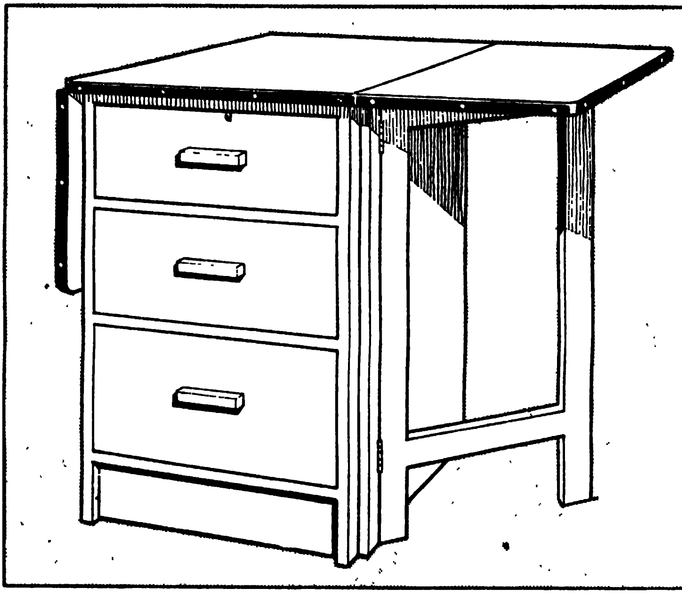


FIG. 266.—KITCHEN TABLE WITH EXTENDING FLAPS.

2 in. long by ¼ in. diameter, each provided with a washer and nut.

KITCHEN TABLE

Most modern kitchens are small, and it is an advantage to give the table the utmost accommodation by fitting drawers as shown in Fig. 266. Furthermore, extending leaves are useful, in that they can be lowered when more

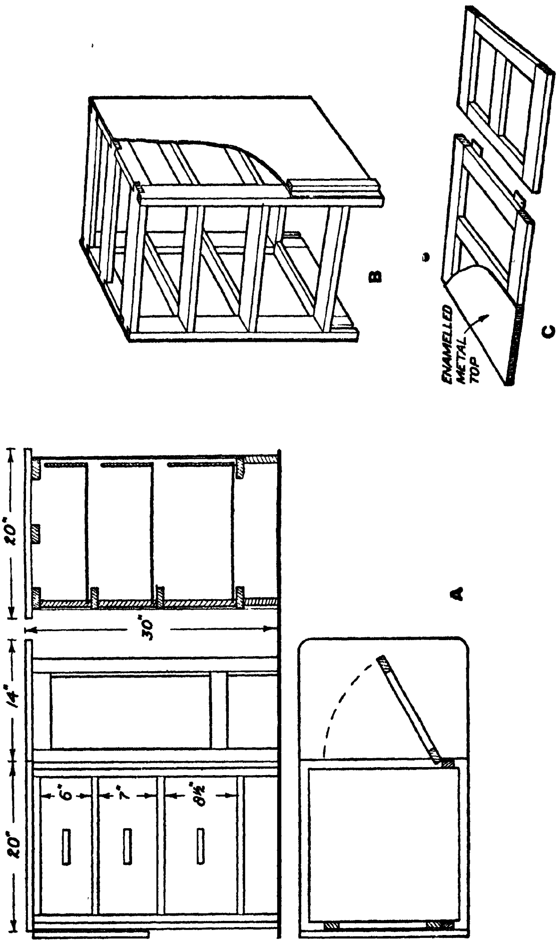


Fig. 267.

A. Front elevation, side section, and plan. *B*. Construction of main carcase. *C*. How tops are made.

room in the kitchen is needed. This table extends to 4 ft. by 20 in., and can be reduced to a length of either

CUTTING LIST

	Length.	Width.	Thickness.
Ends:			
4 Uprights . .	2 ft. 6 in.	2¼ in.	⅞ in.
2 Rails . . .	1 ,, 5 ,,	2¼ ,,	⅞ ,,
2 ,, . . .	1 ,, 5 ,,	4¼ ,,	⅞ ,,
6 ,, . . .	1 ,, 4 ,,	2¼ ,,	⅞ ,,
2 Panels . .	2 ,, 6 ,,	18½ ,,	¼-in. ply
2 Hingeing posts .	2 ,, 6 ,,	1¼ ,,	⅞ in.
Front and back:			
6 Rails . . .	1 ,, 7 ,,	2¾ ,,	⅞ ,,
1 ,, . . .	1 ,, 7 ,,	2¼ ,,	⅞ ,,
2 Plinths . .	1 ,, 6 ,,	4¼ ,,	⅞ ,,
1 Back . . .	2 ,, 1¾ ,,	18¼ ,,	$\frac{3}{16}$-in. ply
Gates:			
4 Uprights . .	2 ,, 6 ,,	2¼ ,,	⅞ in.
4 Rails . . .	1 ,, 2 ,,	2¼ ,,	⅞ ,,
Main top:			
2 Rails . . .	1 ,, 8½ ,,	2¾ ,,	⅞ ,,
3 ,, . . .	1 ,, 8 ,,	2¾ ,,	⅞ ,,
Flaps:			
4 Rails . . .	1 ,, 2½ ,,	2¾ ,,	⅞ ,,
2 ,, . . .	1 ,, 1¾ ,,	2¾ ,,	⅞ ,,
4 ,, . . .	1 ,, 7½ ,,	2¾ ,,	⅞ ,,
Drawers:			
1 Front . . .	1 ,, 4½ ,,	6¼ ,,	⅞ ,,
1 ,, . . .	1 ,, 4½ ,,	7¼ ,,	⅞ ,,
1 ,, . . .	1 ,, 4½ ,,	8¾ ,,	⅞ ,,
2 Sides . . .	1 ,, 5 ,,	6¼ ,,	⅜ ,,
2 ,, . . .	1 ,, 5 ,,	7¼ ,,	⅜ ,,
2 ,, . . .	1 ,, 5 ,,	8¾ ,,	⅜ ,,
1 Back . . .	1 ,, 4½ ,,	5¾ ,,	⅜ ,,
1 ,, . . .	1 ,, 4½ ,,	6¾ ,,	⅜ ,,
1 ,, . . .	1 ,, 4½ ,,	8¼ ,,	⅜ ,,
3 Bottoms . .	1 ,, 3½ ,,	17 ,,	$\frac{3}{16}$-in. ply.

2 ft. 10 in. or 1 ft. 8 in. An enamelled top is an advantage for general kitchen use, though this is not essential.

Make up the main carcase first as at Fig. 267 to the sizes

given at *A*. The two end frames are put together with mortise and tenon joints, these consisting of two uprights, top and bottom rails, and three cross rails fitted horizontally which will act as drawer runners. These frames are joined by rails, the top ones being dovetailed, and the others tenoned. Before adding these, dovetail slots should be cut at the bottom at front and back to hold the plinths.

Glue up the whole thing, and add drawer guides, glueing and nailing them on the runners. To the sides fix the plywood panels with glue and nails, punching in the last named and filling in the holes. Level the edges and screw on uprights near the front as shown in the plan in Fig. 267, *B*. These serve as hingeing posts for the gates. The screws can be driven into them through the main uprights, so that they are concealed.

The gates are plain frames tenoned together. They are hinged at the front as shown in the plan in Fig. 267. The tops are also simple frames as shown at *C*, Fig. 267, and the enamelled metal tops are fixed with screws driven in at the edges. The flaps are hinged afterwards, and it will be found an advantage to lay all three tops face downwards on the bench when doing this. It may be necessary to file away the metal locally. Fix the main top with screws driven upwards through the rails.

Drawers call for no special remark. Preferably they should be dovetailed, but they could be made in a simpler way as described in the section on drawer-making.

Kitchen Cabinet

5 ft. 9 in. high by 3 ft. wide

The kitchen cabinet illustrated in Fig. 268 is shown as in one carcase, the ends running from floor to top. This provides for a wide table top of unbroken surface. If

preferred, the upper and lower carcases may be assembled separately and afterwards screwed together. In this case the upper carcase will have a solid bottom dovetailed

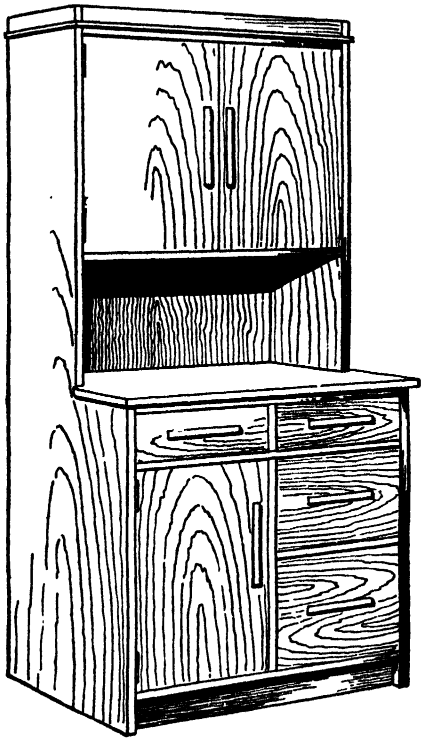


FIG. 268.—KITCHEN CABINET, 5 FT. 9 IN. HIGH, 3 FT. WIDE.

Could be either in polished oak or in whitewood finished with enamel.

to the upper ends, this resting on mitred linings 2½ in. wide by ½ in. thick. If, too, the frieze effect is not required, the top (*K*) may be dovetailed to the ends, thus making the upper cupboard 2 in. higher. The height of

cabinet may be increased to 6 ft. if desired. The design is suitable for carrying out in American whitewood for staining or enamelling, but the design is also such that, if required for a living-room, oak may be used.

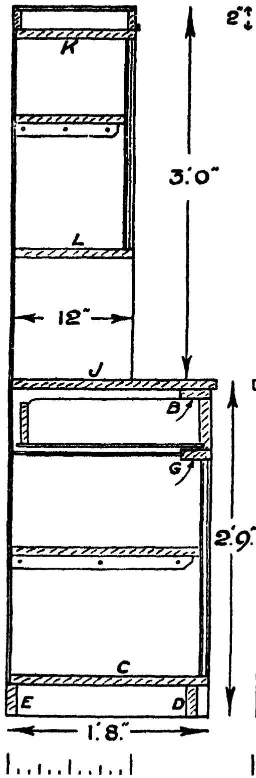


FIG. 269.—SIDE SECTION.

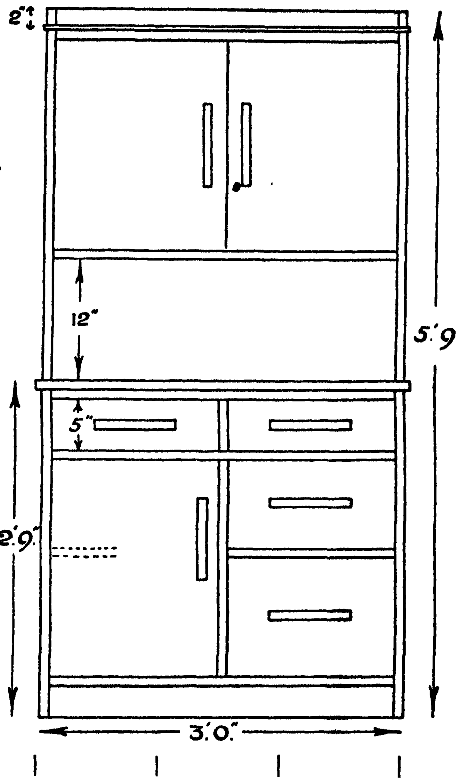


FIG. 270.—FRONT ELEVATION.

The ends (*A*) will be jointed to width, note being made of the break for the upper carcase. The bearer rail (*B*) is dovetailed on, and the bottom (*C*) should be dovetail-housed in. The plinth rail (*D*), which stands in about

$\frac{7}{8}$ in., is fitted by dovetail-notching, whilst the back rail (*E*) is lap-dovetailed on. Before fitting, the worker should decide whether the plywood carcase back is to be rebated in, or, in the simpler way, screwed on over all.

The division (*F*), with its continuation piece, may be

CUTTING LIST

	Length.	Width.	Thickness.*
(*A*) 2 Ends	5 ft. 9 in.	20 in.	$\frac{7}{8}$ in.
(*B*) Bearer rail	3 „ 0 „	3 „	$\frac{7}{8}$ „
(*C*) Bottom	3 „ 0 „	20 „	$\frac{7}{8}$ „
(*D*) Front plinth rail	3 „ 0 „	3 „	$\frac{7}{8}$ or $1\frac{1}{8}$ in.
(*E*) Back „ „	3 „ 0 „	3 „	$\frac{7}{8}$ in.
(*F*) Division	2 „ 5 „	3 „	$\frac{7}{8}$ „
(*G*) Drawer rail	3 „ 0 „	3 „	$\frac{7}{8}$ „
(*H*) „ „	1 „ 6 „	3 „	$\frac{7}{8}$ „
(*J*) Table top	3 „ 2 „	21 „	$\frac{7}{8}$ „
(*K*) Upper cabinet top	3 „ 0 „	12 „	$\frac{7}{8}$ „
(*L*) „ „ bottom	3 „ 0 „	12 „	$\frac{7}{8}$ „
(*M*) Front frieze rail	3 „ 0 „	2 „	$\frac{7}{8}$ „
(*N*) Back „ „	3 „ 0 „	2 „	$\frac{7}{8}$ „
(*O*) Frieze fillet, in all	5 „ 6 „	$\frac{3}{8}$ „	$\frac{3}{8}$ „
Carcase back	5 „ 4 „	36 „	plywood
Lower inside shelf	1 „ 7 „	17 „	$\frac{7}{8}$ in.
Upper „ „	2 „ 11 „	11 „	$\frac{7}{8}$ „
Plywood top	3 „ 0 „	12 „	plywood
Lower door	1 „ 10 „	17 „	$\frac{3}{4}$ in.
2 Upper doors	1 „ 9 „	18 „	$\frac{3}{4}$ „
2 Drawer fronts	1 „ 5 „	5 „	$\frac{7}{8}$ „
1 „ front	1 „ 5 „	9 „	$\frac{7}{8}$ „
1 „ „	1 „ 5 „	12 „	$\frac{7}{8}$ „

Drawer sides, [illegible] in.; back, $\frac{1}{2}$ in.; bottoms, $\frac{1}{4}$-in. or $\frac{3}{8}$-in. plywood. Drawer pulls and door handles, 8 in. by 1 in. or $1\frac{1}{4}$ in. All thicknesses given in the above list are net. Lengths and widths allow for joints and fitting.

halved to the drawer rail (*G*) and tenoned to bottom and to bearer rail. The drawer rails (*G* and *H*) are tenoned. Drawers runners, kickers and (if wanted) dustboards will be added. The table top (*J*), jointed to width, is shown overhanging about $\frac{1}{2}$ in. at front and ends. Preferably it should be dovetail-housed to the ends, but here a plain housing will serve if the shelf above (*L*) is dovetail-housed

in. The projecting ends of the table top will be neatly rounded at the break. The top is screwed to the bearer rail (*B*) from below.

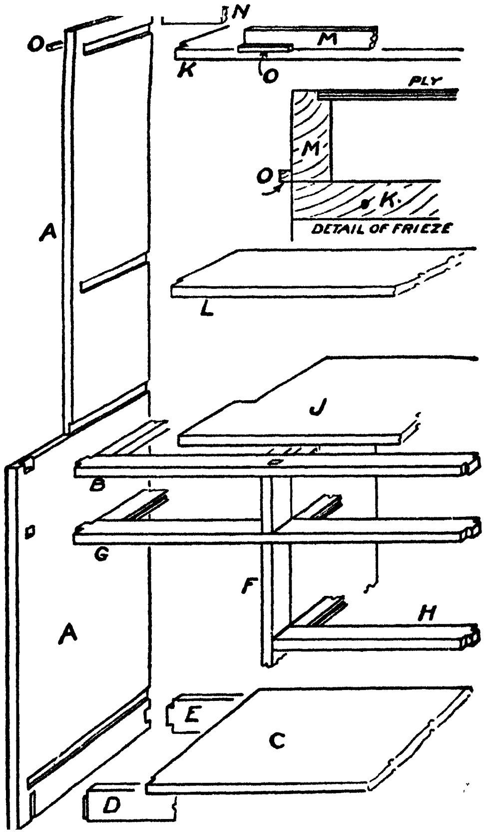


FIG. 271.—ASSEMBLING THE CARCASE.

Coming to the upper carcase, the top (*K*) is dovetail-housed to the ends. The frieze rails (*M* and *N*) resting on this may be dowelled or tenoned in position, whilst the

fillet member (*O*), $\frac{3}{8}$ in. square in section, is glued and pinned on, mitred at the corners and returned at the ends.

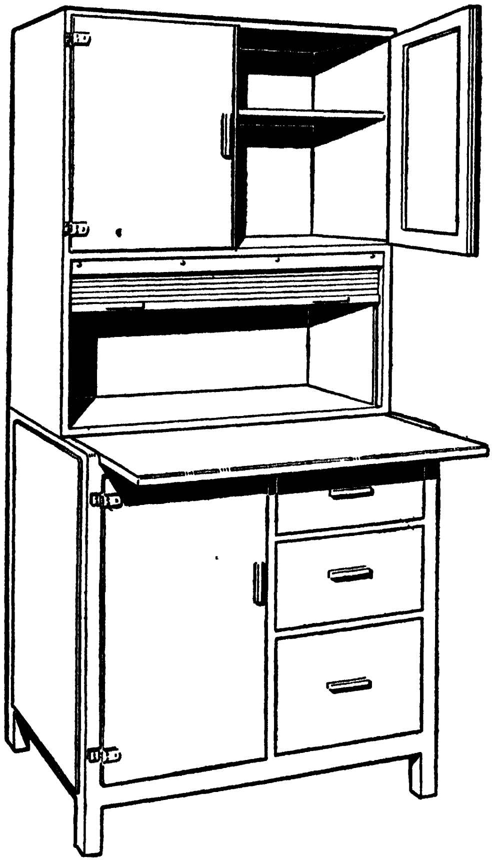


FIG. 272.—KITCHEN CABINET IN WHITE PAINT.

The dustboard on top should (preferably) be rebated in. Inside shelves may rest on fillets, so as to be adjustable.

Drawer fronts will be of $\frac{7}{8}$-in. stuff. Doors may be of

$\frac{3}{4}$-in. laminated board or $\frac{5}{8}$-in. plywood, the edges being lipped with solid $\frac{3}{16}$-in. strip hardwood. Alternatively, the doors may be framed up of $2\frac{1}{4}$ in. by $\frac{5}{8}$ in., halved at the corners and covered on both sides with plywood panels. If the upper doors are to be glazed use 2 in. by $\frac{7}{8}$ in. for the frames.

AN ALTERNATIVE KITCHEN CABINET

Finished in white paint or enamel, this makes an attractive and useful addition to the kitchen. Practically any wood can be used providing that it is sound and free from knots. There is no objection to woods being mixed, because the finish covers up the surface. Open-grained woods such as oak are not so successful, because it is difficult to cover this. Sizes can be adapted if desired, though it is suitable for average requirements as shown.

It is made in two separate carcases, the upper one standing on the other and secured with pocket screws. A tambour front is fitted at the bottom of the upper carcase, this running in grooves and sliding upwards and backwards. Between the two carcases is a sliding top covered with enamelled metal. Normally these are made in stock sizes, and it would be advisable to obtain it first. Otherwise it may have to be made specially.

LOWER CARCASE

The construction of this is given in Fig. 274. Make up the two end frames, each consisting of two posts $1\frac{1}{2}$ in. square joined by four rails fitted flush at the outside. The three lower rails are 2 in. wide, and the top one $2\frac{1}{2}$ in. All are $\frac{7}{8}$ in. thick, and are tenoned into the posts. Plywood panels with rounded edges are glued and pinned at the outside after the surface has been levelled.

These two frames are joined by rails as in Fig. 274. At the top the inner corners of the posts are cut away level

with the side rails so that the sliding top can be fitted. Cut horizontal mortises to take the top rails, which lie flat as shown. Centre uprights are required to hold the

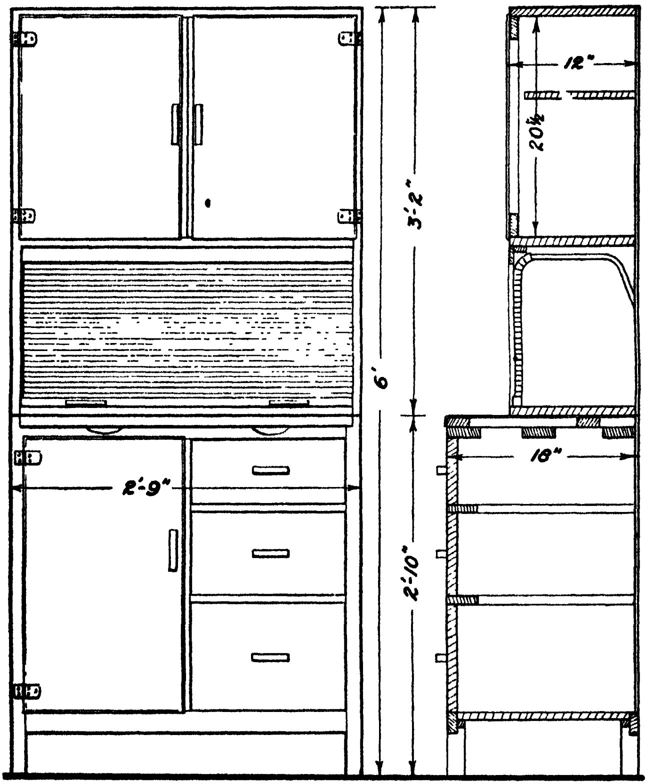


Fig. 273.—Front Elevation and Side Section.

drawer rails and the runners, and these are tenoned in; also the rails. Cut the last named around the corner posts. When assembling, glue the drawer rails to the centre upright, add top and bottom rails, and fit the whole to the side frames.

Runners are fixed at the front into notches cut at the back of the rails. At the back they are screwed. Guides are needed on top to enable the drawers to run properly.

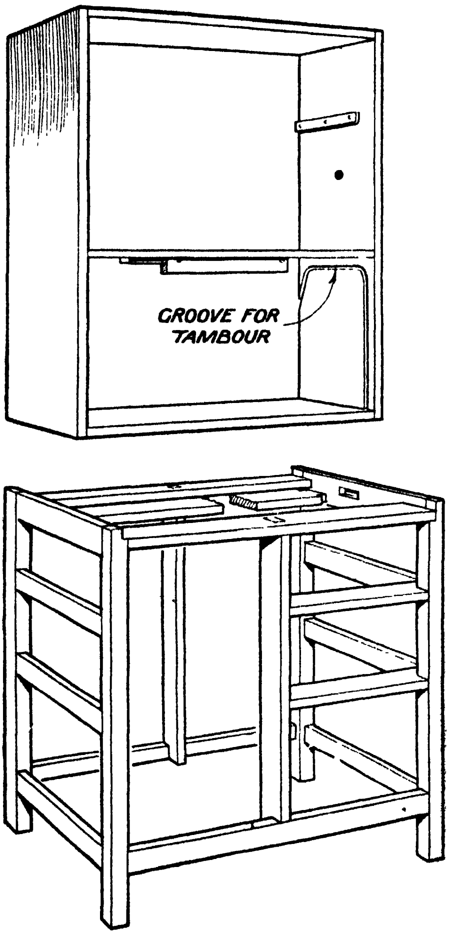


FIG. 274.—HOW THE TWO CARCASES ARE MADE.

The bottom rests upon fillets screwed to the rails (see section in Fig. 274). Fillets are also fixed to provide a rebate for the back.

The door is a plain square-edged frame tenoned to-

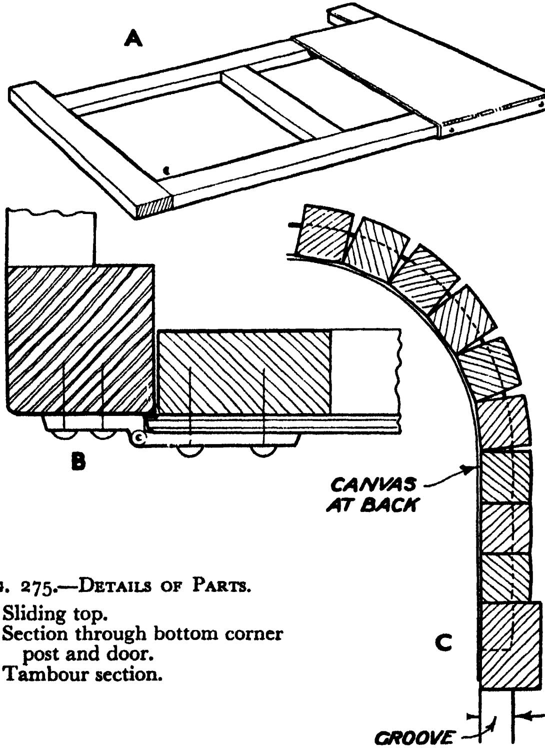


FIG. 275.—DETAILS OF PARTS.

A. Sliding top.
B. Section through bottom corner post and door.
C. Tambour section.

gether with a plywood panel glued and pinned to the front. It overhangs all round to help make the cupboard dust-proof, and this necessitates special cranked hinges as shown at *B*, Fig. 275. Drawers are dovetailed as described in Chapter III. Details of the sliding top are given at *A*, Fig. 275. This must have clearance to run

between the carcases, including the metal top. Stops consisting of short dowels are let into the bottom of the back rail to bear against the front rail when opened. This necessitates channels being cut across the middle top rail so that the dowels clear. Hollow recesses are cut at the front edge of the top rail to give finger grips for the sliding top (see Fig. 273).

TOP CARCASE

This is lap-dovetailed together, with the middle shelf fitting in stopped grooves. The ends are rebated to hold the back, and the top, bottom, and shelf finish flush with these rebates. Before assembling plot out and cut the grooves to take the tambour (Fig. 274). The grooves are $\frac{3}{8}$ in. wide in the straight parts, and rather wider at the curves to give clearance. Note how the grooves run out at the back to enable the tambour to be fed in afterwards.

The carcase being together, prepare the tambour, consisting of a series of strips $\frac{1}{2}$ in. square. The ends are shouldered at the front so that they enter the grooves. Note that the projecting ends are rounded over at the front so that they negotiate the curves. The bottom slat is bigger, $\frac{7}{8}$ in. by $\frac{5}{8}$ in., but the projecting ends are the same size (see dotted lines, *C*, Fig. 275). All the strips are glued to a piece of fine, strong canvas. The latter does not project into the grooves. Be careful not to allow the glue to run between the slats. When the glue has set bend the tambour backwards so that it gives around the curves. Candlegrease makes a good lubricant, but should not be applied until after the whole has been painted.

The doors are made similarly to that at the bottom, except that rebates are worked where they meet at the centre to keep out dust. The whole is finished by a slip

screwed beneath the shelf to conceal the bend of the tambour. A fillet is fixed to conceal it as shown in the section in Fig. 273.

CUTTING LIST

	Length.	Width.	Thickness.
Lower carcase			
4 Posts . . .	2 ft. 10½ in.	1½ in.	1½ in.
6 Side rails . .	1 ,, 5½ ,,	2⅛ ,,	⅞ ,,
2 ,, ,, . .	1 ,, 5½ ,,	2⅝ ,,	⅞ ,,
2 ,, panels . .	2 ,, 5 ,,	17½ ,,	¼ ,,
3 Top rails . .	2 ,, 9 ,,	3⅛ ,,	⅞ ,,
2 Bottom rails .	2 ,, 9 ,,	2⅛ ,,	⅞ ,,
2 Uprights . .	2 ,, 5½ ,,	3⅛ ,,	⅞ ,,
2 Rails . . .	1 ,, 5 ,,	3⅛ ,,	⅞ ,,
1 Back . . .	2 ,, 4½ ,,	30½ ,,	¼ ,,
1 Bottom . .	2 ,, 8 ,,	17 ,,	⅝ ,,
2 Door stiles . .	2 ,, 3 ,,	2⅛ ,,	⅞ ,,
2 ,, rails . .	1 ,, 3 ,,	2⅛ ,,	⅞ ,,
1 ,, panel . .	2 ,, 2¾ ,,	16 ,,	¼ ,,
1 Drawer front .	1 ,, 3 ,,	6¼ ,,	⅞ ,,
1 ,, ,, .	1 ,, 3 ,,	8¼ ,,	⅞ ,,
1 ,, ,, .	1 ,, 3 ,,	10¼ ,,	⅞ ,,
2 ,, sides .	1 ,, 5½ ,,	6¼ ,,	⅜ ,,
2 ,, ,, .	1 ,, 5½ ,,	8¼ ,,	⅜ ,,
2 ,, ,, .	1 ,, 5½ ,,	10¼ ,,	⅜ ,,
1 ,, back .	1 ,, 3 ,,	5¾ ,,	⅜ ,,
1 ,, ,, .	1 ,, 3 ,,	7¾ ,,	⅜ ,,
1 ,, ,, .	1 ,, 2 ,,	9¾ ,,	⅜ ,,
3 ,, bottoms .	1 ,, 2 ,,	17 ,,	3/16 ,,
2 Sliding top rails .	2 ,, 6 ,,	2⅛ ,,	⅞ ,,
2 ,, ,, .	1 ,, 6½ ,,	3 ,,	⅞ ,,
1 ,, ,, .	1 ,, 2 ,,	3 ,,	⅞ ,,
Top carcase			
2 Ends . . .	3 ,, 2¼ ,,	12¼ ,,	⅞ ,,
3 Pieces (top, bottom, shelf) . . .	2 ,, 9 ,,	12 ,,	⅞ ,,
1 Shelf . . .	2 ,, 7½ ,,	11 ,,	¾ ,,
2 Door stiles . .	1 ,, 10 ,,	2⅛ ,,	⅞ ,,
2 ,, ,, . .	1 ,, 10 ,,	2⅝ ,,	⅞ ,,
4 ,, rails . .	1 ,, 4 ,,	2⅛ ,,	⅞ ,,
2 ,, panels .	1 ,, 10 ,,	16 ,,	¼ ,,
28 Strips (approx.) .	2 ,, 8½ ,,	⅝ ,,	½ ,,
1 ,, . . .	2 ,, 8½ ,,	1 ,,	⅝ ,,
1 Piece . . .	2 ,, 8 ,,	2 ,,	⅜ ,,

Allowance is made in lengths and widths. Thicknesses are net. Smaller parts are extra.

CHAPTER X

THE BEDROOM

Bedside Pedestal

It is always desirable to give good accommodation to an item of this kind because of the many things handy

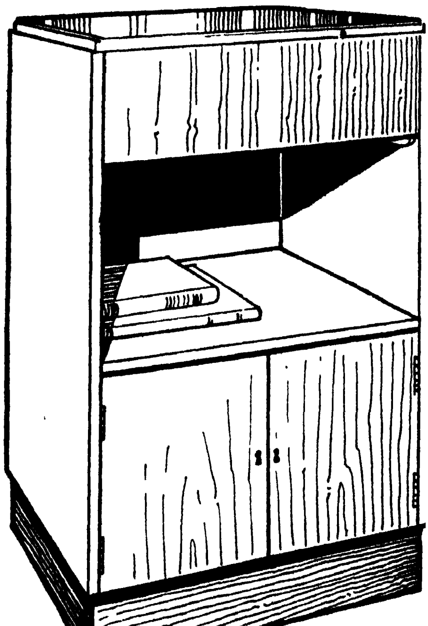


Fig. 276.—Bedside Pedestal Cupboard with Drawer, Cupboard, and Shelf.

at the bedside—books, alarm clock, etc., and room for the early morning tea tray. The pedestal shown in Fig. 276 has a useful drawer, a shelf, and cupboard. Almost any

wood can be used, and it would be effective if a darker wood were used for the plinth. As shown, the drawer front and doors are veneered, but those who prefer could use solid wood.

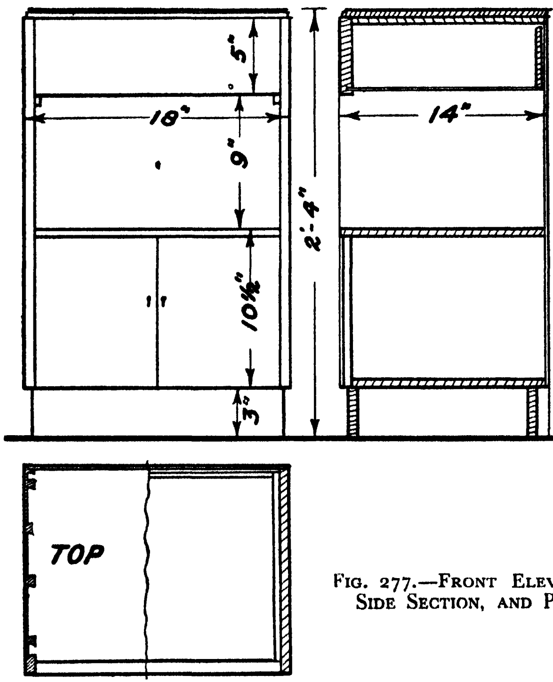


FIG. 277.—FRONT ELEVATION, SIDE SECTION, AND PLAN.

Fig. 278 shows how the main carcase is made. The top and bottom are lap-dovetailed into the ends, and the shelf fits into grooves. Cut the ends to size, jointing two pieces together if necessary. Gauge in the dovetails and mark out the shelf grooves. The last named are stopped at the front.

Whilst the shelf is flush at the front, both top and bottom stand in (see Fig. 278), and all finish level with the

rebates worked in the ends to hold the back. Having cut the joints and worked the rebates, put the whole thing together, putting the shelf in first and knocking in

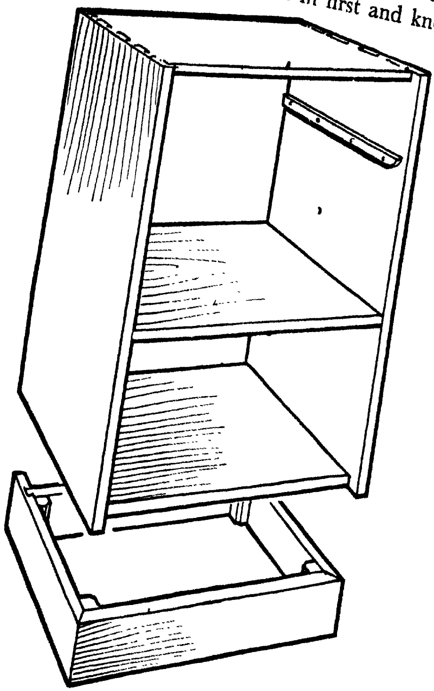


FIG. 278.—VIEW SHOWING CONSTRUCTION.

the top and bottom afterwards. Test for squareness, and when the glue has set level the joints.

Plinth construction is shown in Fig. 278. Front corners are mitred, whilst the back is slot-dovetailed in. Corner blocks are rubbed in the angles to strengthen them. Fix

the plinth with pocket screws driven in at an angle. At the back the holes should be generous in size so that there is slight give in the event of the carcase shrinking. The main top is screwed on from beneath.

Note that the drawer front stands up at the top to stand in front of the under top. Sides and back are dovetailed in the usual way (see page 113). To support the drawer, runners are screwed across the ends (see Fig. 278). Doors should preferably be of thick ply or laminated board veneered both sides. Otherwise solid wood can be used.

CUTTING LIST

	Length.	Width.	Thickness.
2 Ends . . .	2 ft. 1 in.	14¼ in.	¾ in.
1 Under top . .	1 ,, 6 ,,	13¼ ,,	½ ,,
1 Bottom . .	1 ,, 6 ,,	13¼ ,,	⅝ ,,
1 Shelf . . .	1 ,, 5¾ ,,	14 ,,	⅝ ,,
1 Top . . .	1 ,, 6 ,,	14 ,,	½ ,,
1 Back . . .	2 ,, 1 ,,	18 ,,	¼ ,,
1 Plinth front .	1 ,, 5½ ,,	3¼ ,,	¾ ,,
1 ,, back .	1 ,, 5 ,,	3¼ ,,	¾ ,,
2 ,, sides . .	1 ,, 2 ,,	3¼ ,,	¾ ,,
2 Doors . .	10¼ in.	8½ ,,	¾ ,,
1 Drawer front .	1 ,, 5 ,,	5¼ ,,	⅞ ,,
1 ,, back .	1 ,, 5 ,,	4½ ,,	⅜ ,,
2 ,, sides .	1 ,, 1¾ ,,	4¾ ,,	⅜ ,,
1 ,, bottom .	1 ,, 4½ ,,	13½ ,,	¼ ,,

SINGLE BEDSTEAD WITH FLUSH PANELLED HEAD AND FOOT

The single bedstead is very popular at the present time. Married people usually prefer to have a pair of twin bedsteads rather than the double 4-ft. 6-in. size. That shown in Fig. 279 is in the modern style with rather low head and foot, and it is flush panelled, no framework being visible. It could be made in any hardwood, oak, walnut, or mahogany, ready veneered plywood panels being used. Any of the standard mattress fittings could be used. They require simply to be screwed in position.

The main sizes are given in Fig. 280, and the construction in Fig. 281. It will be seen that there is a main framework consisting of $1\frac{1}{2}$-in. square end posts, and two intermediate uprights and horizontal rails of $\frac{7}{8}$-in. stuff. These are joined together with mortise and tenon joints

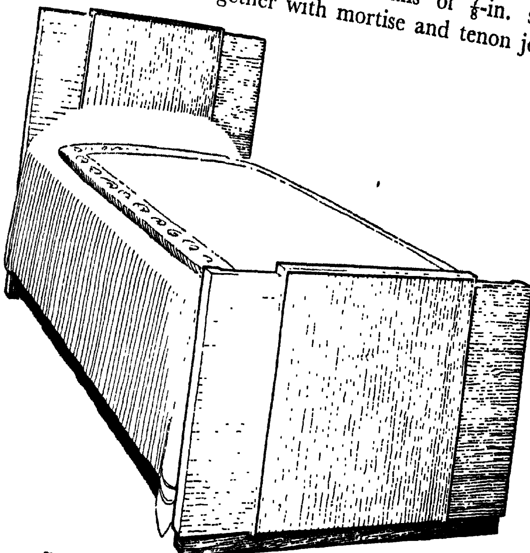


FIG. 279.—SINGLE BEDSTEAD IN MODERN STYLE.
It is made up of sheets of plywood fixed to a solid framework. Oak, walnut, or mahogany could be used.

as in Fig. 282. Note that the broken top edge is formed by cutting away the top rail at the ends.

The two posts have a finished length of 2 ft., but it is advisable to allow a little extra, as there is then less liability for the wood to split when the mortises are chopped. It also allows for trimming after assembling. Fix them together with a cramp and square across both

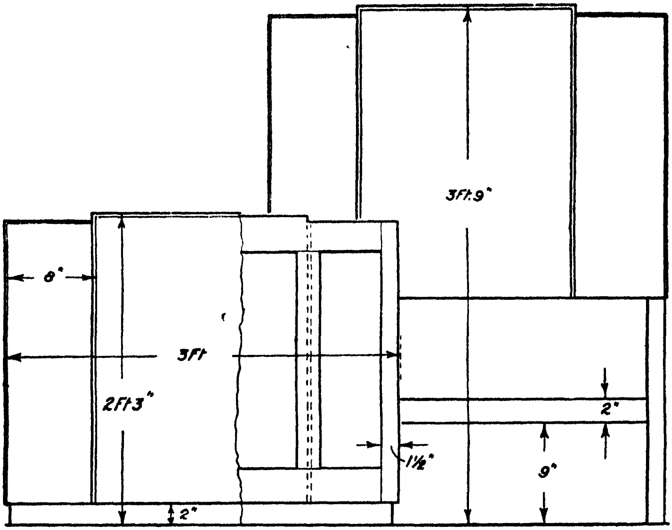


FIG. 280.—ELEVATIONS OF HEAD AND FOOT WITH SIZES.

CUTTING LIST

	Length.	Width.	Thickness.
Head:			
2 Posts . . .	3 ft. 9½ in.	1½ in.	1½ in. (Finished)
2 Uprights . .	2 ft.	2⅛ "	⅞ in.
2 Rails . . .	3 "	3⅛ "	⅞ "
1 Rail . . .	3 "	2⅛ "	⅞ "
1 Panel . . .	2 ft. 1½ in.	20 "	$\frac{3}{16}$-in. ply
2 Panels . .	8 in.	2 ft. ½ in.	$\frac{3}{16}$ "
Foot:			
2 Posts . . .	2 ft. 1 in.	1½ in.	1½ in. (Finished)
2 Uprights . .	2 ft.	2⅛ "	⅞ in.
2 Rails . . .	3 "	3⅛ "	⅞ "
1 Panel . . .	2 ft. 1½ in.	20 "	$\frac{3}{16}$-in. ply
2 Panels . .	8 in.	2 ft. ½ in.	$\frac{3}{16}$ "
1 Plinth . .	3 ft.	2⅛ in.	1⅛ "

Fillets and small parts are extra.
Set of bedstead fittings and castors.

the positions of the mortises. (Actually both head and foot can be marked out and proceeded with at the same time. Only the foot is dealt with here for clearness.) Note that the tenons are set down at the top (Fig. 282). The mortises must, of course, be set down correspondingly.

The intermediate uprights can also be prepared. They are tenoned into the rails, and the shoulder length can be taken from the marks on the posts. The rails are both

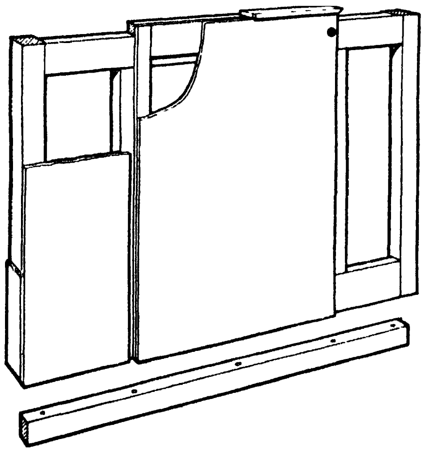


FIG. 281.—HOW PLYWOOD IS FIXED TO FRAMEWORK.

3 in. wide, and they are fixed together temporarily with a cramp so that the joints can be marked. Remember to mark the mortise positions as well as the shoulders at the ends. The top rail is sawn away at the top at both ends.

All the joints having been cut, the whole thing is assembled. Glue the intermediate uprights to the rails, cramp up, and add the posts lastly. Test to see that the whole is square and not in winding, and allow the glue to set. The joints can then be levelled. In the case of the

head there is an extra head to be added 9 in. from the bottom.

The centre panel is raised slightly, and this is done by first fixing pieces of $\frac{3}{16}$-in. stuff as shown in Fig. 281. It

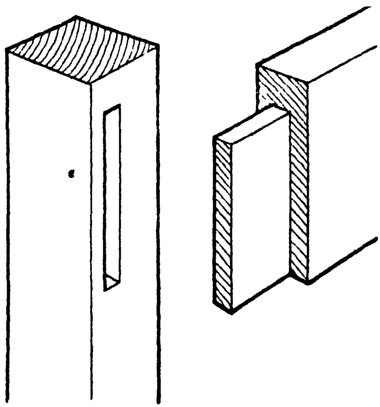


FIG. 282.—JOINT FOR FRAMEWORK.

can also be seen in the section in Fig. 283. The centre panel is fixed over these. If well cramped down all round, glue alone will hold the ply, otherwise fine pins can be driven in at intervals, these being punched in

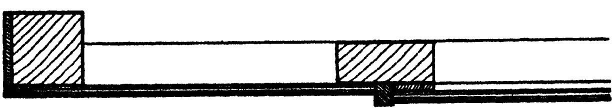


FIG. 283.—ENLARGED PLAN SECTION OF ONE END.

and the holes filled with plastic wood. The side panels are fixed direct to the framework. They are flush at top, bottom, and outer side, but a $\frac{3}{8}$-in. gap is allowed between them and the centre panel. A square fillet is fixed in this gap as shown in the section in Fig. 283. It is not added,

however, until after the edges of the framework have been covered by a $\frac{1}{8}$-in. covering fillet (see section, Fig. 283). This goes at the posts and on top of the side panels, so covering the edges of the ply. Above the centre panel a $\frac{3}{8}$-in. piece is fixed. This enables the square fillet to be returned at the top, being mitred to those in the gaps at each side of the panel. The plinth is a piece of 2-in. by $1\frac{1}{8}$-in. stuff screwed on beneath.

This completes the woodwork, and it remains but to stain and polish the whole and add the fittings. Wax polish looks well on oak or walnut. Mahogany, too, could be waxed, though most people prefer french polish. Recessed castors or domes of silence could be fitted at the bottom.

Modern Style Dressing-Table

The tall mirror used in conjunction with the pedestal type dressing-table is popular nowadays. That shown in Fig. 284 is an example. It has the mirror pivoted between the pedestals, and the last named are fitted up as cupboards. A foot-rest is provided beneath the mirror so that it is comfortable in use. Three methods of construction are given, of which the best is that with mortise and tenon joints. The other two have dowelled and halved joints, and these, although not so strong, have the advantage of simplicity. Apart from this choice of joints for the various frames, the main method of construction is the same in every case.

Figs. 285 and 286 give the main sizes and Fig. 287 the construction. It will be seen that each pedestal consists of two side frames and a top, and both are joined to a common bottom which rests upon the plinth. It is in the construction of these frames that the reader can choose which form of joint he will use. The panels are of ply-

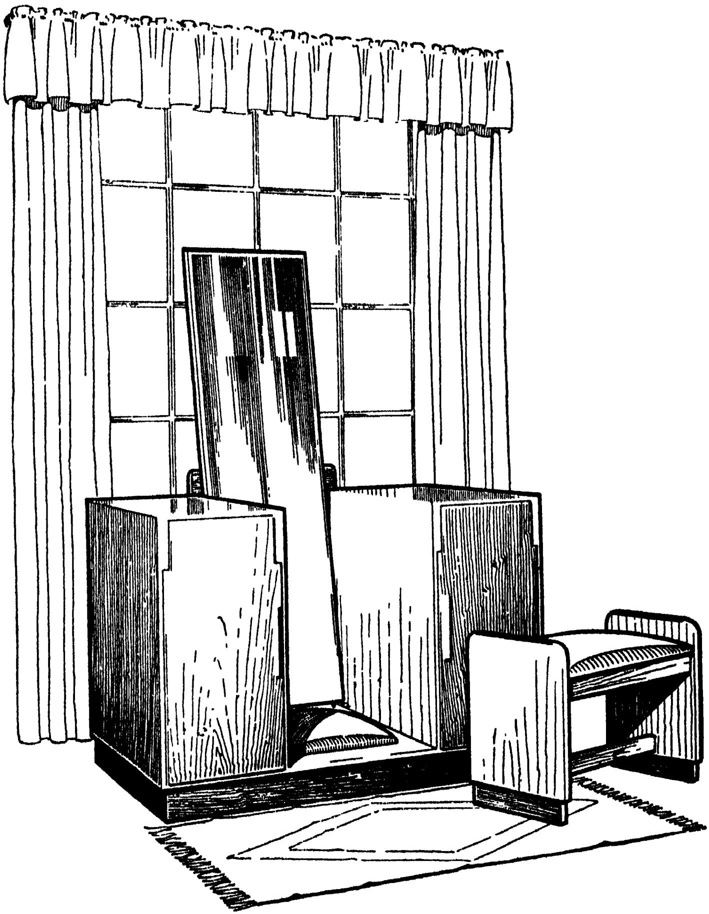


FIG. 284.—DRESSING-TABLE WITH PEDESTALS AND TALL MIRROR.

The construction has been specially simplified, plywood panels being fixed to frames.

wood, and are fixed to the outside of the frames. This, in addition to being in the modern style, has the advantage of avoiding grooves in the framing.

The four frames are made up first. They are similar, but those at the outside have their uprights projecting downwards as shown in Fig. 287, so that they pass down and make a secure fixing with the bottom. The various parts can be fixed together temporarily with a cramp so that the joints are marked alike. The three varieties of joints are given in Fig. 288, and allowance in the length has to be made in accordance with the joint chosen. When the joints are cut, the frames can be glued up and the joints levelled after they have set. A sheet of plywood is fixed to the outside of each, the edges being rounded to give a neat finish. If cramped down with thumbscrews, glue alone will hold them. Alternatively, fine nails can be driven in, these being punched in and the holes filled with plastic wood.

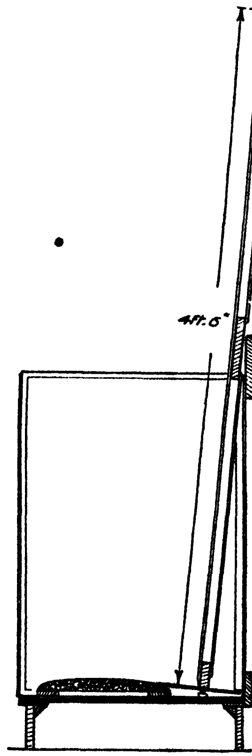


FIG. 285.—SIDE SECTION.

The bottom should preferably be a piece of $\frac{1}{2}$-in. plywood. It is cut to size and the corners are cut to fit round the projecting uprights of the end frames. To the under-side $\frac{3}{8}$-in. thicknessing pieces are glued and screwed as in Fig. 289 to make up a thickness of $\frac{7}{8}$ in. At the front

a facing is fixed to hide the layers of the ply. Upon this bottom are marked the positions of the inner frames (see dotted lines in Fig. 287). From these marks can be taken the length of the pedestal tops. These again are of ½-in. plywood with thicknessing pieces beneath and facings at the front as shown in Fig. 287. The ends are lapped to fit over the frames. The joints are

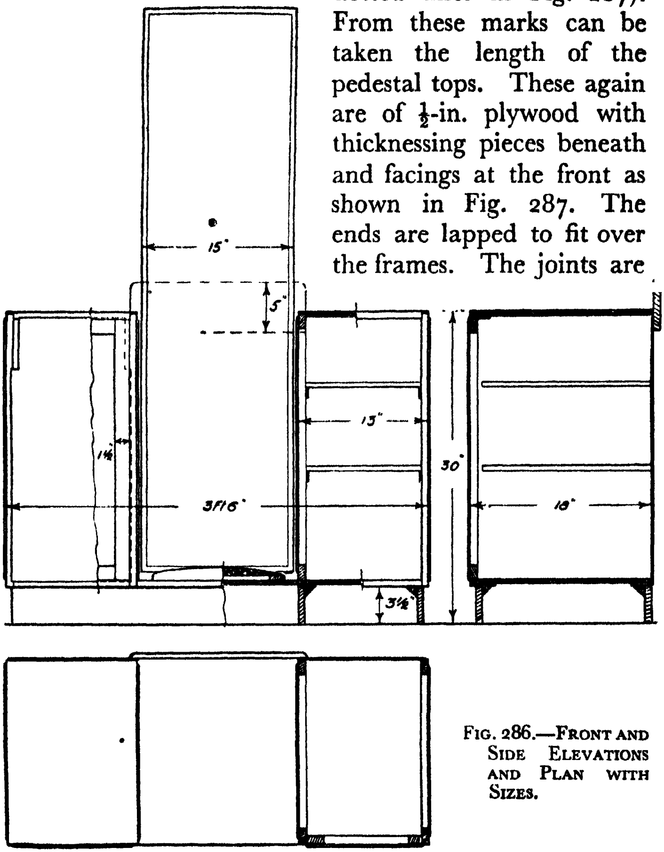


Fig. 286.—Front and Side Elevations and Plan with Sizes.

gauged in and cut by sawing across the grain and chiselling out the waste. It is an advantage to make the lap line up with one of the layers of the ply. Before fixing together, the bearers to support the shelves can be screwed on as in Fig. 287.

When assembling, the frames are first screwed to the bottom. Glue is also used. The tops are then added,

CUTTING LIST

	Length.	Width.	Thickness.
Pedestals :			
4 Uprights	2 ft. 3 in.	$1\frac{5}{8}$ in.	$\frac{3}{4}$ in.
4 ,,	2 ,, $2\frac{1}{2}$,,	$1\frac{5}{8}$,,	$\frac{3}{4}$,,
8 Rails	1 ,, $6\frac{1}{2}$,,	$1\frac{5}{8}$,,	$\frac{3}{4}$,,
8 Bearers	1 ,, $5\frac{1}{2}$,,	$1\frac{1}{8}$,,	$\frac{1}{4}$,,
4 Panels	2 ,, 2 ,,	$17\frac{1}{2}$,,	$\frac{3}{16}$ in. ply
4 Shelves	1 ,, $1\frac{1}{4}$,,	17 ,,	$\frac{1}{2}$,,
2 Backs	2 ,, 3 ,,	13 ,,	$\frac{3}{16}$,,
2 Tops	1 ,, $1\frac{1}{4}$,,	18 ,,	$\frac{1}{2}$,,
1 Bottom	3 ,, $6\frac{1}{4}$,,	18 ,,	$\frac{1}{2}$,,
1 Rail	1 ,, 6 ,,	$5\frac{1}{4}$,,	$\frac{3}{4}$,,
1 ,,	1 ,, 6 ,,	$3\frac{1}{8}$,,	$\frac{3}{4}$,,
Plinth :			
2 Pieces	3 ,, $5\frac{1}{2}$,,	$3\frac{5}{8}$,,	$\frac{3}{4}$,,
4 ,,	1 ,, 6 ,,	$3\frac{5}{8}$,,	$\frac{3}{4}$,,
Doors :			
4 Uprights	2 ,, 2 ,,	$1\frac{5}{8}$,,	$\frac{3}{4}$,,
4 Rails	1 ft.	$1\frac{5}{8}$,,	$\frac{3}{4}$,,
2 Panels	2 ft. 2 in.	$12\frac{1}{4}$,,	$\frac{3}{16}$ in. ply
Mirror :			
2 Uprights	4 ,, $6\frac{1}{2}$,,	$2\frac{1}{8}$,,	$\frac{3}{4}$ in.
2 Rails	1 ,, $3\frac{1}{2}$,,	$2\frac{1}{8}$,,	$\frac{3}{4}$,,
1 Rail	1 ,, $3\frac{1}{2}$,,	5 ,,	$\frac{3}{4}$,,
2 Backs	2 ,, 1 ,,	14 ,,	$\frac{3}{16}$ in. ply
Foot Rest :			
2 Pieces	1 ,, $1\frac{1}{2}$,,	$1\frac{5}{8}$,,	$\frac{3}{4}$ in.
2 ,,	$11\frac{1}{2}$ in.	$1\frac{5}{8}$,,	$\frac{3}{4}$,,

Thickness pieces, facings, and small parts extra.
2 Pairs $1\frac{1}{2}$-in. brass butt hinges.
1 12-in. Piano type hinge.
1 Stay, 2 ball catches, and handles.
1 Mirror, 4 ft. 6 in. by 15 in.

nails being driven in dovetail fashion at the joints. Test for squareness and, when the glue has set, level the joints. The backs can be screwed on, and a back rail is added as in Fig. 290. This steadies the pedestals and provides a

convenient rail to which the mirror can be hinged. Another similar rail is added at the bottom, as shown in the side section in Fig. 285.

The construction of the plinth is given in Fig. 287. The

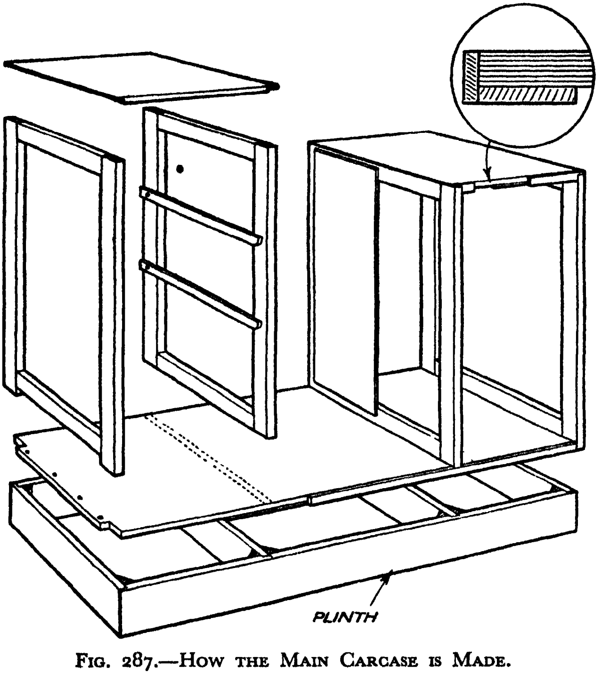


FIG. 287.—HOW THE MAIN CARCASE IS MADE.

corners are lapped, and the intermediate rails are fixed in grooves cut in the front and back. It is a good plan to mark out the plinth on the under-side of the bottom so that the exact length of the various parts can be measured. It can be fixed with a few screws driven downwards through the bottom and strengthened with glue blocks rubbed in as in Fig. 286.

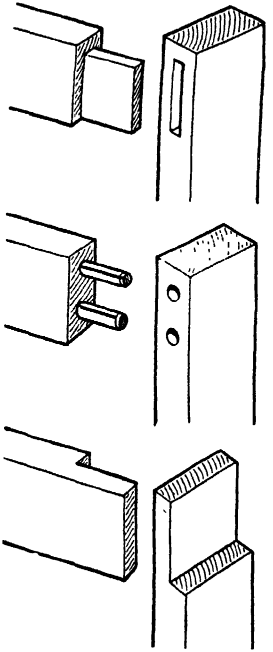


FIG. 288.—ALTERNATIVE JOINTS FOR THE FRAMES.

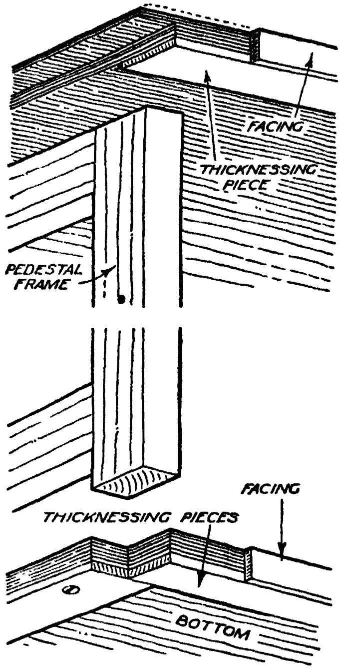


FIG. 289.—ENLARGED DETAILS OF PEDESTAL CONSTRUCTION.

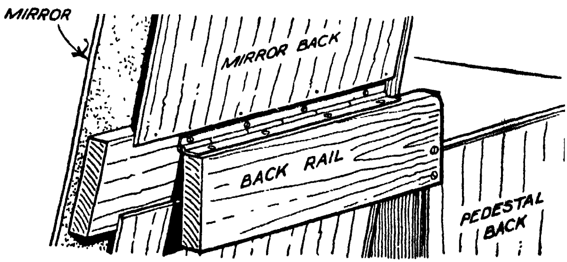


FIG. 290.—HOW MIRROR FRAME IS HINGED TO BACK RAIL.

Details of the doors are given at *A*, Fig. 291. The frames are put together with one of the joints given in

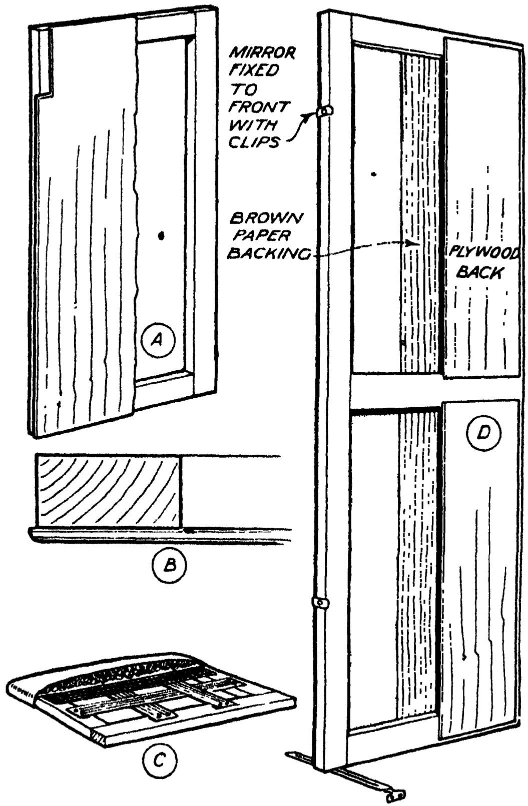


FIG. 291.—CONSTRUCTION DETAILS.
A and *B*. Method of making doors.
C. Foot-rest details.
D. How mirror frame is made.

Fig. 288, and panels of plywood are glued at the front. These can project about $\frac{1}{8}$ in. at the sides to help make the cupboards dust-proof. Note that the top corners are cut in.

The edges should be rounded at the front to give a neat finish. When hingeing them, the hinges should be made to project at the front to avoid binding. Otherwise the plywood must finish flush at the hingeing end.

The mirror, although frameless in the sense that no frame is visible, has a back supporting frame. This is made as shown at *D*, Fig. 291. A sheet of brown paper is laid between it and the mirror, and the latter secured with clips as shown. Fig. 290 shows how it is hinged to the back rail with a piano-type hinge. At the bottom a metal stay is added as in Fig. 291, so that it can be fixed in any position. *C*, Fig. 291 gives details of the foot-rest. It is simply a frame made with mortise and tenon or halved joints glued and screwed together. Webbing is strained across the top and a piece of canvas tacked above. The hair stuffing follows (being held with loops of twine as shown in Fig. 293, page 320) and another piece of canvas tacked on top. A sheet of cotton-wool follows, and the final cover is laid over the whole and tacked underneath. The frame is fixed with screws driven upwards through the bottom.

If oak has been used, a coat of stain followed by wax polishing is recommended.

Stool with Upholstered Seat

Although it would come in suitably for general use, this stool is primarily intended for the bedroom, where it would prove specially handy for use in front of the dressing-table. Its height makes it suitable for the average type of dressing-table, but it could be varied a few inches if necessary. It could be made in any hardwood, and be stained and polished to match existing furniture. The construction is of the simplest form, the rails being through-tenoned to the ends or legs, and held with wedges.

The seat is made up and upholstered separately and fixed on with screws.

Prepare the legs or ends first from $\frac{7}{8}$-in. wood. They are planed square to finish 17 in. by 13 in., and if necessary two pieces can be jointed together to make up the width. Three mortises are required in each, and the position of these must be marked out. Note from *B*, Fig. 292, that the rails are shouldered in their width, so that the wedges have something against which to pull. There are no shoulders in the thickness, so that the mortises are cut to the full thickness of the rails—$\frac{7}{8}$ in. It is advisable to mark in the over-all width of the rails and square in lines $\frac{1}{4}$ in. inside these. This allows $\frac{1}{4}$-in. shoulders. To make sure that both legs are marked alike, the marks should be squared across the edges of both, and then be squared across both back and front sides.

When chopping the mortises, the waste can be bored away for the greater part. They are then chopped out with the chisel, half from each side. Take special care to make the sides nice and clean. When the joints have been cut, the top corners can be rounded.

Now proceed with the three rails, cutting them from $\frac{7}{8}$-in. stuff. All measure 22 in. long. The top two rails are 2 in. wide, and that at the bottom is 4 in. To mark the shoulders fix all three together and square the marks across the edges. The shoulder length is $17\frac{1}{4}$ in. Saw in the sides and cut the shoulders, and fit in each joint individually. Whilst this is being done the mortises to hold the wedges can be marked. Press the tenon tightly home and make a pencil mark at the outside of the leg. A little reflection will show that the mortise has to be cut a trifle *inside* this pencil line, as otherwise the wedges will not pull against the legs. This is shown clearly by the dotted lines at *C*. Note also from this diagram that the *outer* side of the mortise slopes slightly to line up with

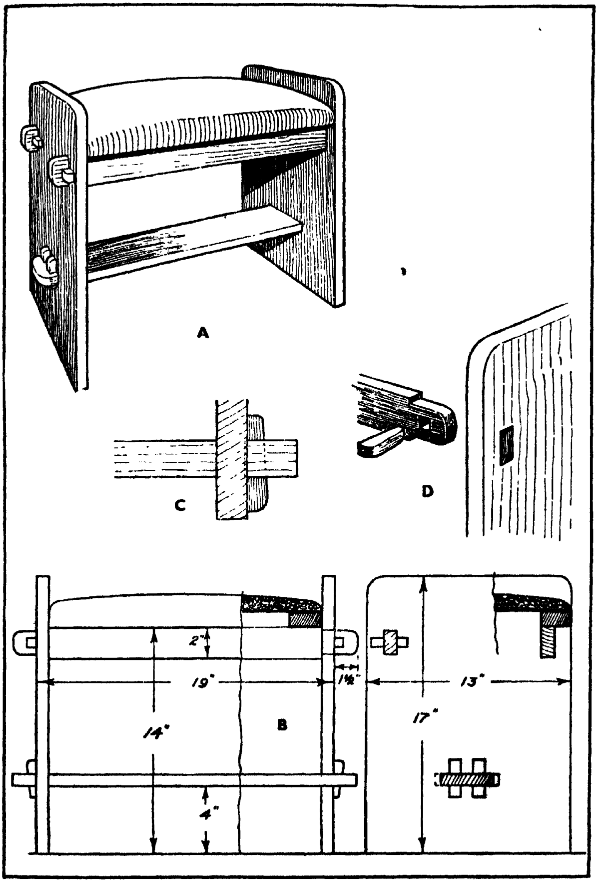


FIG. 292.—HANDY STOOL SUITABLE FOR THE DRESSING-TABLE.

A. The completed stool. *B.* Front and side elevations.
C. Plan section of wedged joints. *D.* Detail of the wedged joints.

the taper of the wedge. When all joints have been fitted, the ends of the tenons can be rounded over and the wedges finished off. It is advisable to stain and polish all parts before finally assembling.

CUTTING LIST

	Length.	Width.	Thickness.
2 Ends . . .	$17\frac{1}{4}$ in.	$13\frac{1}{8}$ in.	$\frac{7}{8}$ in.
2 Rails . . .	$22\frac{1}{2}$,,	$2\frac{1}{8}$,,	$\frac{7}{8}$,,
1 Rail . . .	$22\frac{1}{2}$,,	$4\frac{1}{8}$,,	$\frac{7}{8}$,,
Seat :			
2 Rails . . .	$17\frac{3}{4}$,,	$2\frac{1}{8}$,,	$\frac{7}{8}$,,
2 ,, . . .	$13\frac{1}{2}$,,	$2\frac{1}{8}$,,	$\frac{7}{8}$,,
8 Wedges . .	$2\frac{3}{4}$,,	$\frac{3}{4}$,,	$\frac{3}{4}$,,
Upholstery materials extra.			

For the seat a framework of 2-in. by $\frac{7}{8}$-in. stuff is put together with either halved or mortise and tenon joints.

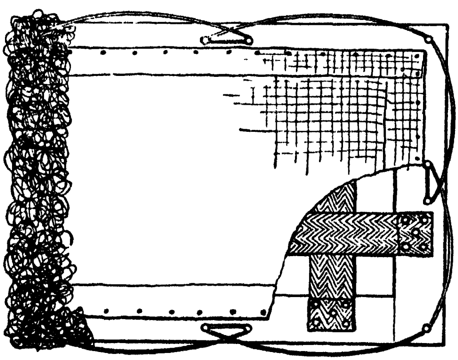


FIG. 293.—HOW HAIR STUFFING IS PACKED BENEATH LOOPS OF TWINE.

When glued up it should be trimmed at least $\frac{1}{8}$ in. bare at both ends to allow for the thickness of the upholstery. All sharp edges and corners should be taken off.

For the upholstery there should be three strands of

webbing across the width and two across the length, these being interlaced. The ends should be doubled where the webbing tacks are driven in. They are fixed at the top of the frame. Above, a piece of canvas is stretched and fixed with tacks. A second and larger piece of canvas is now tacked at one edge to the underside of the frame. To prevent the hair stuffing from moving about, a series of twine loops is fixed with tacks as shown in Fig. 293. The tacks are driven in half-way, to allow the twine to be taken around them, and then hammered home. Under these loops the stuffing is packed firmly as shown, and the centre portion filled afterwards. The second canvas cover can now be drawn over and tacked. It is best to drive in tacks at the centre first and work towards the corners. The hair should be distributed as evenly as possible, and to assist in this a pointed instrument such as a skewer can be stuck through the canvas and the hair worked about as required.

Above the canvas a sheet of cotton wool is laid, and the final covering placed over this. It is tacked at the underside, the centres being fixed first. Work towards the corners and snick the cover to make a neat finish. The whole seat is fixed with screws driven upwards through the rails.

WARDROBE

A width of 3 ft. 6 in. gives quite good accommodation for clothing, and is big enough for the small modern house. Sizes could be adapted within a little, however, to suit individual requirements. Two suggestions for fitting the interior are given (Fig. 295), but here again readers can adapt the design to suit themselves. It will be seen that the construction is specially simplified by the use of plywood panels fixed over a series of frames, but,

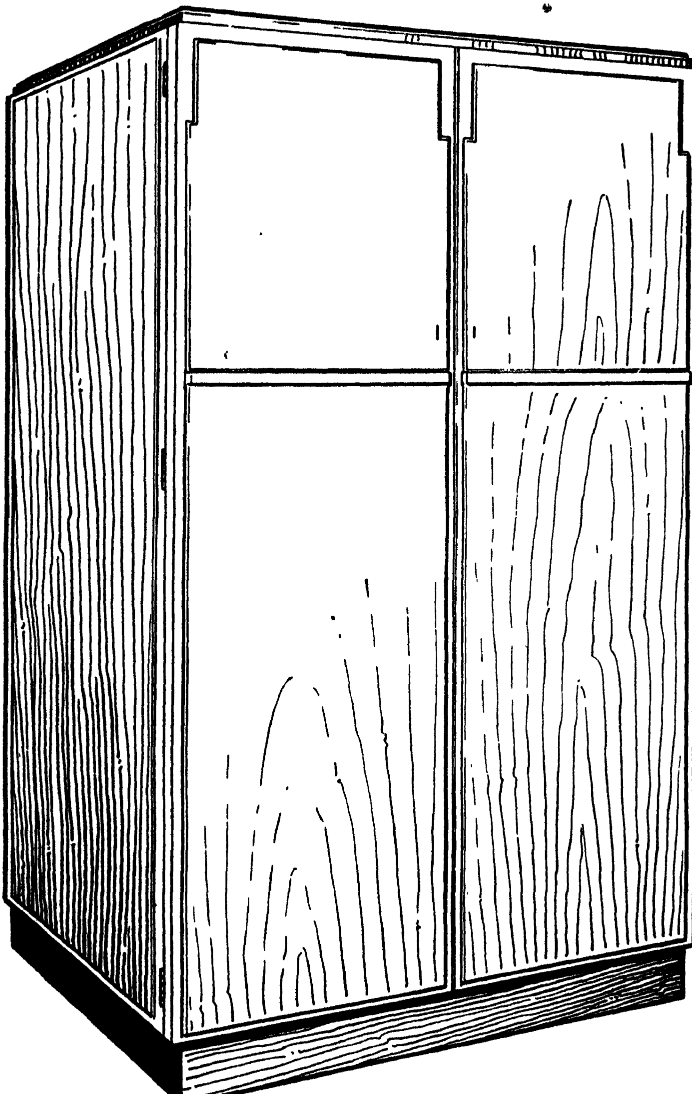


FIG. 294.—WARDROBE, 3 FT. 6 INS. WIDE.

in place of the more conventional grooved-in panels, the last named are glued and pinned to the face of the frames.

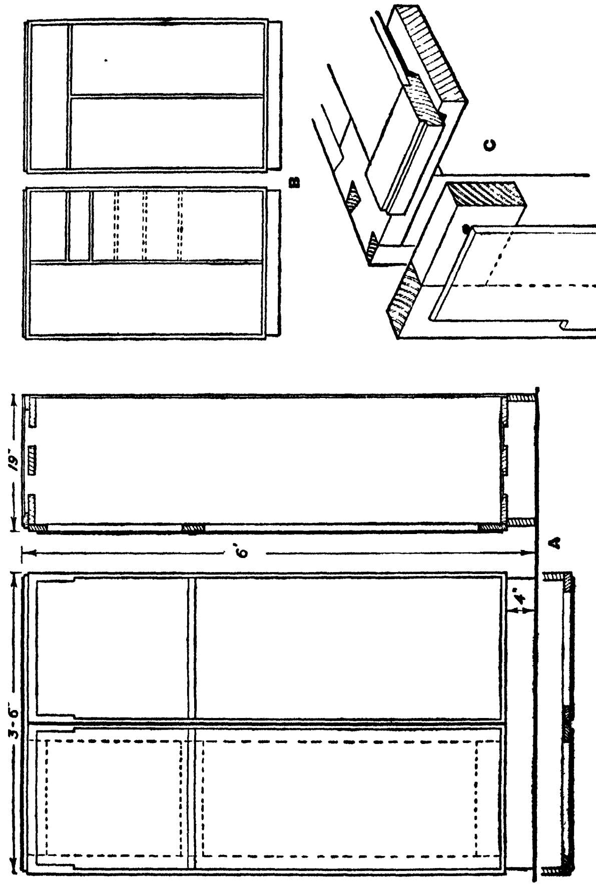


FIG. 295.
A. Front elevation and plan and side sections.
B. Alternative arrangement. *C.* Construction of carcase.

Apart from the " flush " appearance they thus have, they help considerably to strengthen the whole, since the ply binds the joints together.

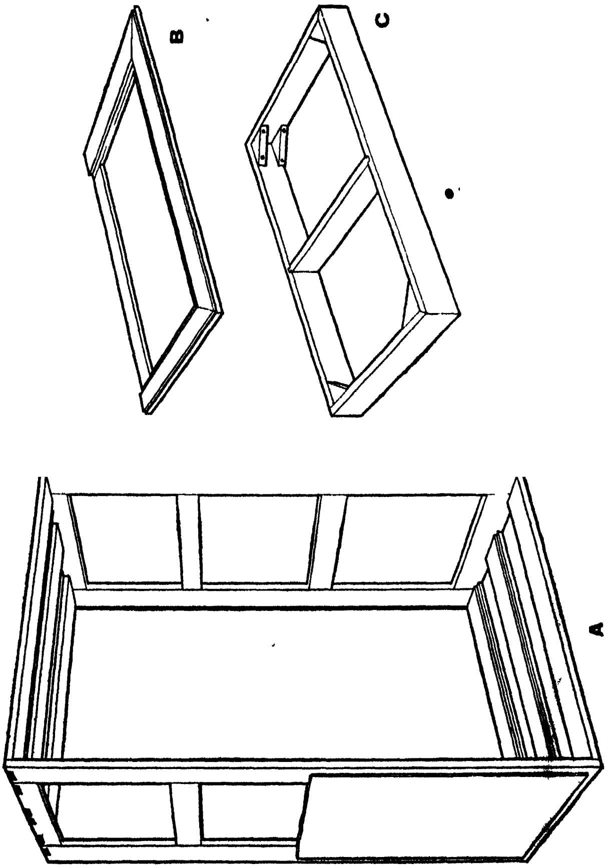
Fig. 295 gives sizes, and Fig. 296 the construction. Note that there is a main carcase to which the narrow cornice or top and plinth are added. Make up the carcase first. It consists of two plywood-covered frames joined by a series of top and bottom rails. If large sheets of ply or laminated board are available, these can be used instead of the separate top and bottom rails, but it is not advisable to use solid wood, as trouble due to shrinkage may be experienced. The side frames are made with 3-in. by $\frac{7}{8}$-in. parts put together with mortise and tenon joints. Glue these together, level the surfaces, and glue and pin the sheets of plywood to the outer sides. Note how the ply stands in all round. Its edges should be slightly rounded over to give a neat finish. Punch in the nails and fill in the holes with plastic wood.

As shown in Fig. 296 and enlarged in Fig. 295, the rails are dovetailed in position. Those at the top are square-edged, but the bottom rails are rebated to hold filling panels of plywood (Fig. 296). It is necessary to allow for these rebates when cutting the dovetails. The front rails are flush with the front edges, but those at the back are set in level with the rebates worked along the inner back edges of the side frames. Thus, the back which drops in the rebates is screwed directly to the back rails.

It should be noted here that if only a loose shelf is needed this can rest on battens screwed to the sides. If, however, it is to be subdivided as in Fig. 295, it is better to house in the parts permanently, as this helps to make the carcase rigid.

Glue up the whole thing, testing for both squareness and winding. When set add the filling panels to the bottom. They are not needed at the top because the top proper covers in the whole thing. The back should be as heavy and strong as possible, partly to give weight to the back to counteract the pull of the doors, and partly to

give rigidity to counter any racketing tendency. If ½-in. plywood is available use this. Otherwise make a strong panelled framework.



96.

A. How main carcase is made. *B.* How top cornice is made. *C.* Construction of plinth

Fig. 296 shows the cornice. It is simply a wide rebated moulding mitred together at the front, and joined by a thinner piece butted at the back. Note that the front

piece must overlap, since the doors reach right to the top of the carcase (see Fig. 295). Fix the parts down with glue and nails and finally fix the top panel in the rebate. The back piece being flush with the rebate, the panel is fixed down directly on to it.

CUTTING LIST

	Length.	Width.	Thickness.
Ends :			
4 Uprights . .	5 ft. 8 in.	3½ in.	⅞ in.
8 Rails . . .	1 „ 6 „	3½ „	⅞ „
2 Panels . .	5 „ 8 „	17 „	¼-in. ply
Top and bottom :			
6 Rails . . .	3 „ 6½ „	4½ „	⅞ „
Back :			
1 Piece . . .	5 „ 8 „	42 „	½-in. ply
Cornice :			
1 Piece . . .	3 „ 6½ „	2¼ „	⅞ „
1 „ . . .	3 „ 2½ „	2¼ „	⅝ „
2 Pieces . . .	1 „ 7½ „	2¼ „	⅞ „
1 Piece . . .	3 „ 4 „	17½ „	¼-in. ply
Plinth :			
1 Piece . . .	3 „ 5½ „	4¼ „	⅞ „
1 „ . . .	3 „ 5½ „	4¼ „	⅞ „
3 Pieces . . .	1 „ 7 „	4¼ „	⅞ „
Doors :			
3 Stiles . . .	5 „ 8 „	2¾ „	⅞ „
1 „ . . .	5 „ 8 „	3¼ „	⅞ „
6 Rails . . .	1 „ 8 „	3½ „	⅞ „
2 Panels . .	1 „ 10 „	20½ „	¼-in. ply
2 „ . .	3 „ 7½ „	20½ „	¼ „

The plinth is mitred together at the front and lap-dovetailed at the back. To stiffen the whole a centre rail is slot-dovetailed between the front and back as in Fig. 296. After assembling, the corners are strengthened by the addition of corner brackets glued and screwed in the angles. Fix the whole thing beneath the carcase with screws driven at an angle through pockets.

The doors are put together with mortise and tenon joints. They are simple square-edged frames, the panels being fixed to the face. Make the frames about $\frac{1}{8}$ in. full in both length and width to allow for fitting. In the best way the frames overlap about $\frac{3}{8}$ in., the joining edges being rebated as in the plan in Fig. 295. This helps to make the wardrobe dust-proof. Otherwise an overlapping moulding must be fixed to the right-hand door. Fit all the panels individually, making sure that the border all round is of equal width throughout. Round the edges neatly. Hinge with three butts to each door.

Dwarf Bookcase

A piece of this kind is suitable for the living-room or bedroom. Its sizes could be adapted within a little if desired, but it is right for average requirements. Oak is the most suitable wood to use, but a softwood could be substituted if preferred. The doors should preferably be of thick multi-ply or laminated board with veneered facing. If this is a difficulty, solid wood could be used, top and bottom edges being clamped to give rigidity across the grain. In this case it is essential that the wood is bone dry.

Prepare the two ends to finish 4 ft. by 9 in., ignoring for the moment the tapered shape. Trim them square, making sure that they are alike in size. Plot in the line of the taper, and square across the inner surfaces the grooves which hold the shelves. These grooves can be either square as at *A*, Fig. 299, or for a better job they can be dovetailed as at *B*. In either case they are stopped short at the front, so that they are not seen. Whilst marking out, the rebate for the back can be gauged; also the deeper rebate to hold the top back rail. The plinth rail also fits in a groove.

To work the grooves chop a notch against the stop of each groove of the finished depth to provide an outlet for the tenon saw when sawing the sides of the groove. It will be a great help if the marks showing the groove

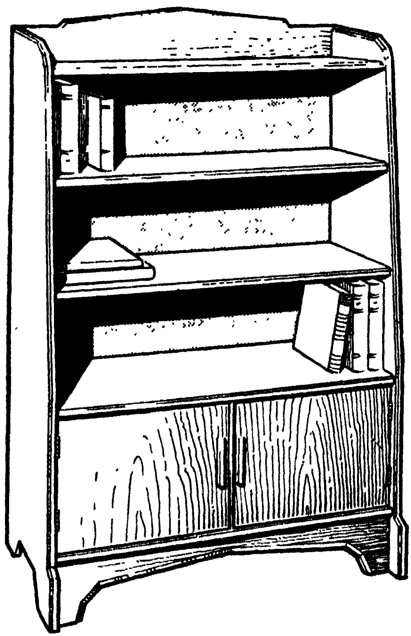


FIG. 297.—DWARF BOOKCASE WITH CUPBOARD.

sides are cut in with the chisel. This will enable shallow sloping grooves to be chiselled out on the waste side, providing convenient channels in which the saw can run. Having sawn in the sides, the bulk of the waste can be chiselled away. Afterwards the router can be used to make the grooves of equal depth. The back rebates can be worked afterwards; also the grooves for the plinth.

If dovetailed grooves are being cut, the saw must be held at an angle when cutting the upper side.

Proceed next with the shelves. All are the same length, but the widths vary in accordance with the tapered ends. If they are to be dovetailed, the joints

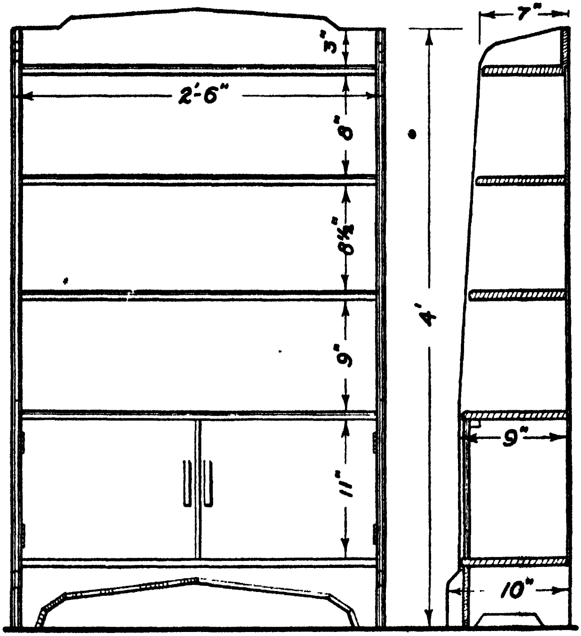


FIG. 298.—FRONT ELEVATION AND SIDE SECTION WITH CHIEF SIZES.

must be worked at the ends. In any case notches or shoulders are needed at the front. In all cases they finish flush with the rebate at the back. All joints being finished, the top front corner of each shelf is chamfered.

Having tried up each joint the taper of the ends can be sawn and trimmed. Also the slight shaping at top and bottom. Pieces to form the projection at the front edge

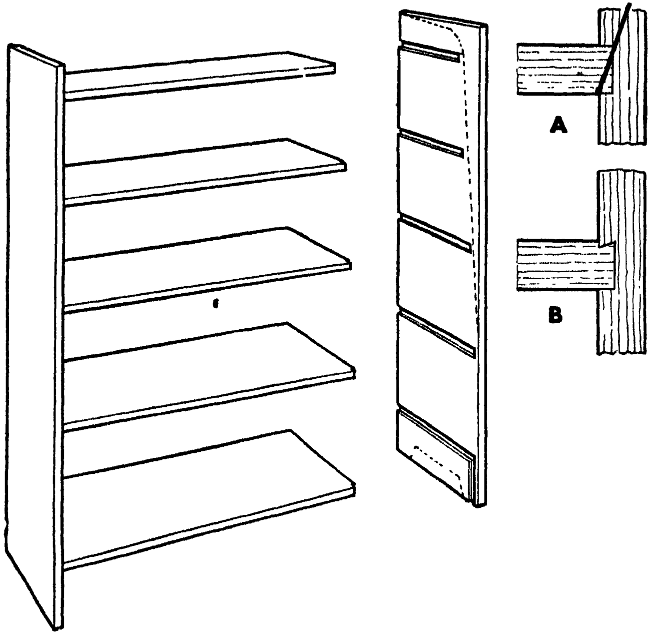


FIG. 299.—HOW THE BOOKCASE IS MADE.

at the bottom are glued on, and when the glue has set the edges are chamfered.

CUTTING LIST

	Length.	Width.	Thickness.
2 Ends . . .	4 ft. ½ in.	9¼ in.	¾ in.
1 Shelf . . .	2 „ 5¼ „	6½ „	¾ „
1 „ . . .	2 „ 5¼ „	7½ „	¾ „
1 „ . . .	2 „ 5¼ „	8¼ „	¾ „
2 Shelves . .	2 „ 5¼ „	9¼ „	¾ „
1 Back rail . .	2 „ 6 „	5¾ „	⅝ „
1 Plinth . .	2 „ 6 „	5¼ „	½ „
1 Back . . .	2 „ 6 „	40½ „	¼ „
2 Doors . .	11¼ in.	14¾ „	¾ „

When assembling apply cramps, and, in the case of square grooves, drive in nails at an angle as shown at *A*, Fig. 299. Put in this way the nails are not seen. The dovetailed grooves need no nails. Both the top back rail and the plinth are put in afterwards. The former is rebated at the bottom edge (Fig. 298) to receive the back. It is glued and held with screws. To strengthen the plinth glue blocks can be rubbed in at the inner corners.

The back being fixed (with screws) the doors can be fitted. To provide a definite closing stop, a fillet is fixed beneath the shelf (see section in Fig. 298).

Fitment for Bed-Sitting Room

The fitment shown in Fig. 300 should prove an excellent arrangement in a bed-sitting room. There is a settee which is convertible into a bed, the lower portion being fitted with locker accommodation which will hold bed-clothes. At the back, and continuing around one side, are bookshelves with a handy shelf at the top. The lower portion to the right forms cupboard space and is enclosed by sliding doors. To the left is a handy bureau with bookshelves beneath.

Fig. 301 shows the general construction. The sizes can be adapted to suit the room in which the fitments are being built, the only size of importance being that of the settee. This should be, say, 6 ft. 6 in. in length by 2 ft. 9 in. wide. A little variation is possible, but it must be ample to form a comfortable bed.

The settee is made up of four frames forming the sides, back, and front. These can be of 2-in. stuff put together with mortise and tenon or halved joints. They are assembled independently, and when the glue has set they are screwed together as shown. There are two inter-mediate frames. These are best fixed by notching the

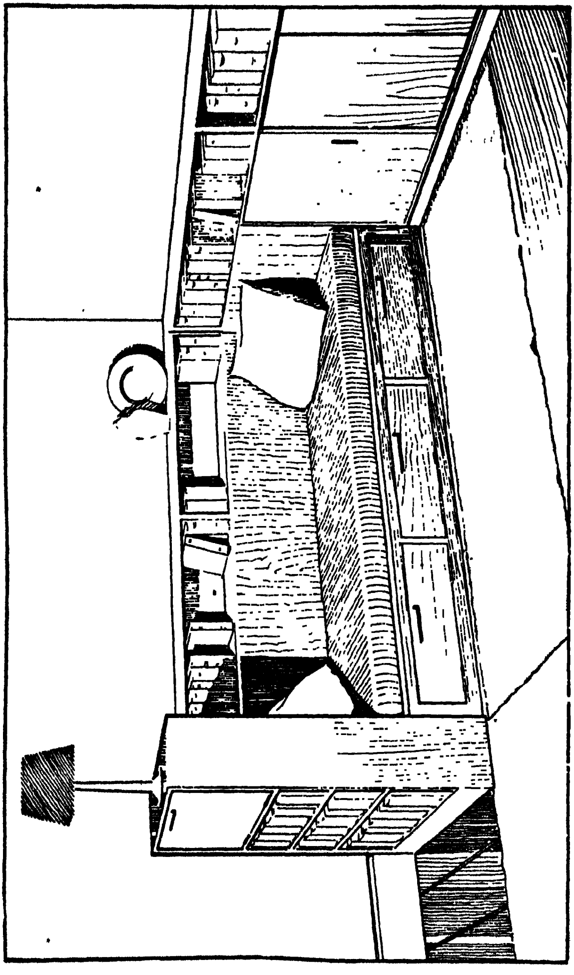


FIG. 300.—SET OF USEFUL FITMENTS FOR THE BED-SITTING ROOM.
The settee is easily converted into a bed when required.

uprights at the front and screwing them. At the back they need not be notched. To them the horizontal members are screwed or nailed. Plywood partitions are nailed in, and thicker plywood bottoms are supported on fillets nailed round. The ply for these can be $\frac{3}{8}$ in. thick. A separate frame is made for the top. It is mortised and tenoned together, and is screwed down in position. Strands of webbing are fixed across the top.

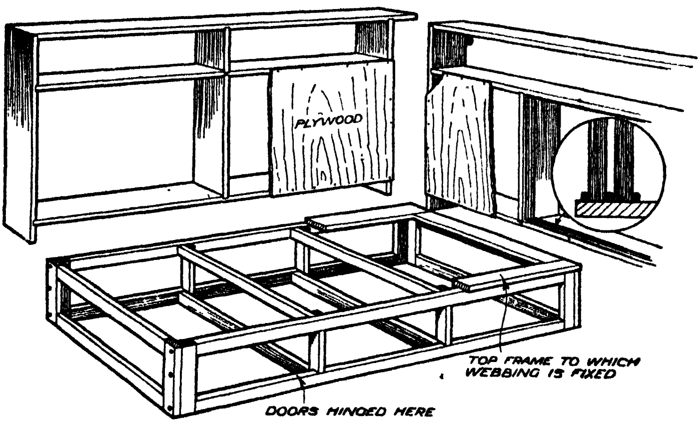


FIG. 301.—HOW FITMENTS FOR BED-SITTING ROOM ARE MADE.

A loose cushion or mattress is required to fit on top. The doors are hinged to the bottom rail, and are held when closed by ball catches.

The construction of the bookshelves and cupboards is obvious from Fig. 301. The parts are joined by lapped and grooved joints, and the lower part, where the settee is placed, is covered with $\frac{3}{16}$-in. plywood. The sliding doors, shown inset, are of $\frac{3}{8}$-in. or $\frac{1}{2}$-in. plywood cut to a fairly easy fit, and beads are nailed down to form runners. Candle-grease rubbed along the bearing surfaces makes a good lubricant.

The bureau is made similarly to the bookshelves, lapped and grooved joints being used. One point in regard to size is that when opened the fall should be 30 in. from the floor. It is hinged at the bottom, and is supported by brass or chromium chains. All the fitments can be fixed with screw plates, the wall being plugged to take the screws. It will probably be necessary to cut away the back edges to fit over the skirting.

CHAPTER XI

THE NURSERY

Child's Cot with Drop Side

Size 4 ft. 3 in. by 2 ft. 3 in.

Before cutting the timbers for a child's cot, procure the wire mattress to be used. Stock sizes are 4 ft. by 2 ft.

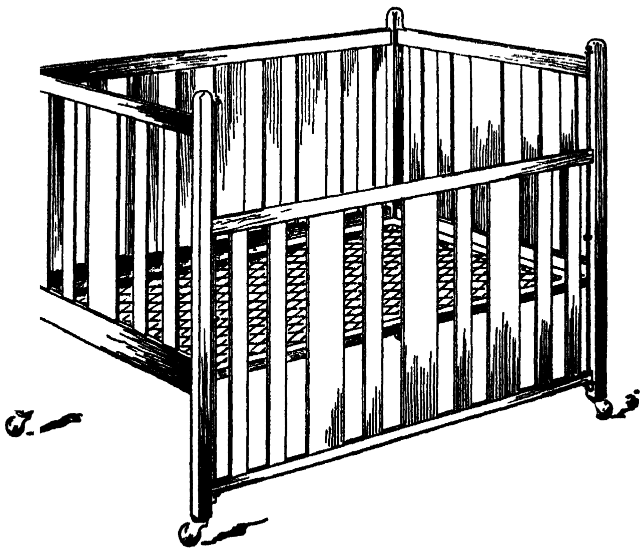


Fig. 302.—Child's Cot with Drop Side.
The cot could be polished hardwood or it could be finished with enamel or cellulose.

over the frame, and (larger) 4 ft. 6 in. by 2 ft. 6 in., and the inside dimensions of the cot should allow for adequate clearance. It is also wise to procure the metal rods and other fittings for the falling side. The rods are made to

standard lengths, and the height of post must allow for fixing at both ends.

Bear in mind, again, that the amount of drop allowed to the front is determined by the distance between the lower rail of the cot and the metal rod stop at the foot of the post. A cot is more rigid if the lower rails are kept within 12 in. to 15 in. of the floor. If castors are included

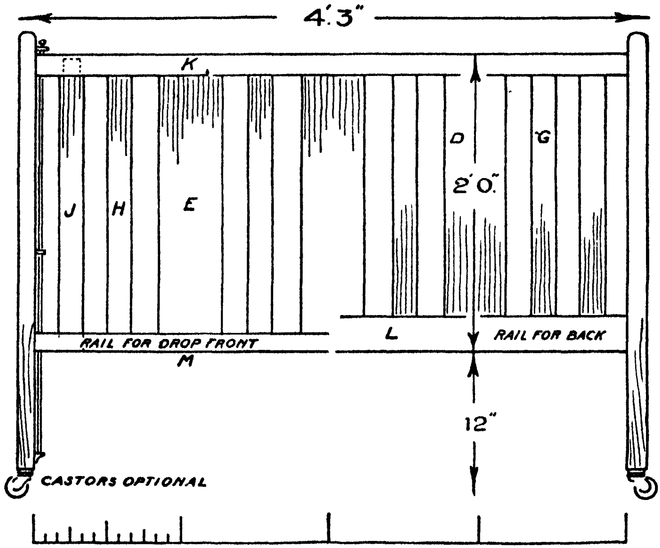


FIG. 303.—(*at left*) FRONT ELEVATION WITH DROP SIDE.
(*at right*) BACK ELEVATION.

in the measurement, the actual drop will be 2 in. or so less. The drop allowed varies from 9 in. to 12 in., according to requirements. If, for any reason, a greater drop is wanted, the lower rails must be raised.

The two ends (Fig. 304) are first completed. Both rails (*B* and *C*) are grooved throughout one edge to take the splats (*D* and *F*). This takes less time than cutting

mortises for each splat. The groove spaces left between are later filled up by short lengths of fillet (*X*, Fig. 305), cut to size, glued and tapped in. For a specially strong cot each end splat (or all four sides) may be entered 1 in. into the top rail and carried right through the lower rail. This is, of course, essential in the case of the drop side (Fig. 303), as otherwise the rails would not have adequate support. The rails of the ends (*B* and *C*) are tenoned to the posts.

CUTTING LIST

	Length.	Width.	Thickness.
(*A*) 4 Posts	3 ft. 3 in.	1½ in.	1½ in.
(*B*) 2 Top end rails	2 " 3 "	1¾ "	⅞ "
(*C*) 2 Bottom end rails	2 " 3 "	3 "	⅞ "
(*D*) 5 Splats (ends and back)	1 " 9 "	5 "	⅜ "
(*E*) 3 " (front)	1 " 10 "	5 "	⅜ "
(*F*) 8 " (ends)	1 " 9 "	1¾ "	⅜ "
(*G*) 6 " (back)	1 " 9 "	2 "	⅜ "
(*H*) 4 " (front)	1 " 10 "	2 "	⅜ "
(*J*) 2 " "	2 " 0 "	2 "	⅜ "
(*K*) 2 Top rails	4 " 3 "	1¾ "	⅞ "
(*L*) Bottom rail (back)	4 " 3 "	3 "	⅞ "
(*M*) " (front)	4 " 3 "	1½ "	⅞ "
(*N*) 2 Battens	4 " 2 "	1 "	⅞ "
2 "	2 " 2 "	1 "	⅞ "

With the ends completed, the rails and splats of the cot back are assembled (Fig. 303) and fitted to the posts, the mattress battens (Fig. 305) screwed on, and the mattress frame (Fig. 306) tested for fitting. Finally, the parts of the drop front are assembled and the metal rods fixed. Note that the lower rail of the drop front is narrower than those of the three other sides.

Remember that for smooth sliding there must be a little clearance between the rails of the drop and the posts. The posts must also project at the top sufficiently to provide for the upper knob which holds the rod in position. It is wise to leave the legs full in length at the foot

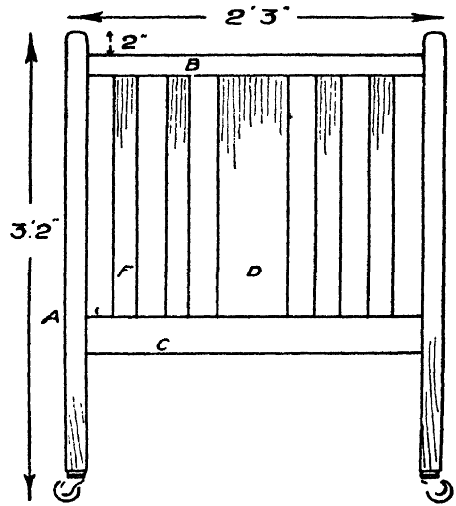


FIG. 304.—ELEVATION OF ENDS.
Rail *C* corresponds with rail *L* of back.

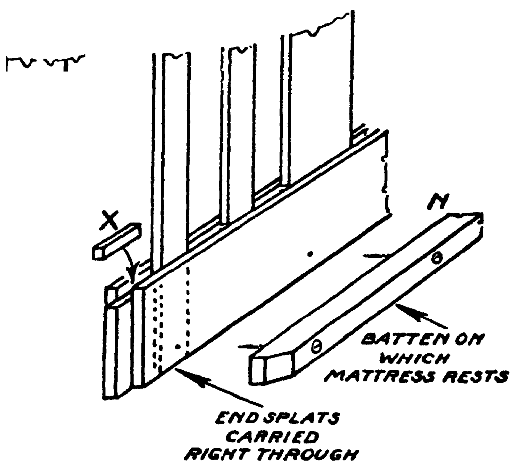


FIG. 305.—SHOWING SPLATS AND MATTRESS BATTEN.

in order that there may be ample bearing for the metal rod stops. They can be cut later. Castors are optional.

Cots may be of oak or mahogany for polishing, birch or beech for staining, or American whitewood for enamelling. The top rails and the tops of posts should be slightly rounded, and all sharp edges on posts, rails, and splats eased with glasspaper.

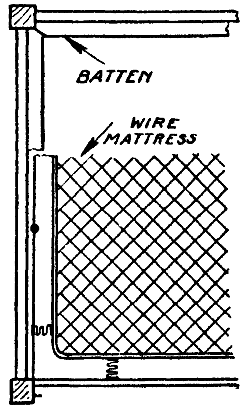


Fig. 306.—Mattress in Position.

Baby's High Chair

The necessity for a high chair soon makes itself felt when a baby arrives in the home. The design in Fig. 307 has proved by experience to be a sound model, including as it does a tray which can be folded back when not required in use. A hardwood is desirable throughout—certainly for the seat and the turned rails—though the legs and back parts could be in deal if free from knots.

Begin with the seat, using a piece of 1-in. stuff and planing it to the sizes given in the plan in Fig. 307. On the underside mark the positions of the legs, giving the overall section size, and marking between them the mortise positions. It is clear that, since the legs are at an angle to give greater stability, either the mortises or the tenons will have to be cut at an angle. Generally it is more convenient to slope the mortises so that the grain of the tenons can be straight. To do this a block of wood should have two of its adjoining edges cut at the same angle as the slope of the legs. This can be placed on the seat against the chisel as a guide to the required slope. Note that the mortises slope in both their length and width.

Since the slope is the same in both directions, the same block of wood can be used as a guide.

On the upper surface of the seat mortises are needed for the back parts and arm-rests. All these parts are upright when viewed from the front, but the back slopes back at an angle as at *B* and *C*, and this means that the mortises for these must slope correspondingly. Cut another block of wood or make a template in cardboard to give the angle, and use this as a guide when chopping.

The legs taper from $1\frac{3}{8}$ in. or $1\frac{1}{4}$ in. at the top down to 1 in. at the bottom. It will be more convenient, however, if this is done after the joints have been set out and cut. The shoulders of the top tenons necessarily slope, and an adjustable bevel should be used for marking if possible. Otherwise nail together two pieces of wood at the required angle and use this for marking. The lower rails can be of $\frac{1}{2}$-in. dowel rod, and the holes for these must be at a corresponding angle. Once again make a block of wood to use as a guide for the bit when boring. They will have to slope slightly across the width as well as in the length. Count the number of turns when boring so that all are the same depth. This is necessary because there are no shoulders to the dowel rods and the rods pass right to the bottom of the holes.

To obtain the exact length lay the legs down on the bench, opening them so that they are in the exact positions they will take up. The lengths can then be measured, and the dowels cut, each pair to the same length. Cramps are an advantage when glueing, and little tapered blocks should be prepared so that the shoes have a suitable surface on which to bed.

Prepare the parts for the back, using mortise and tenon joints. Note that the lower tenons of the uprights will have their shoulders at an angle. The parts can be glued together in the same operation as when the whole is added

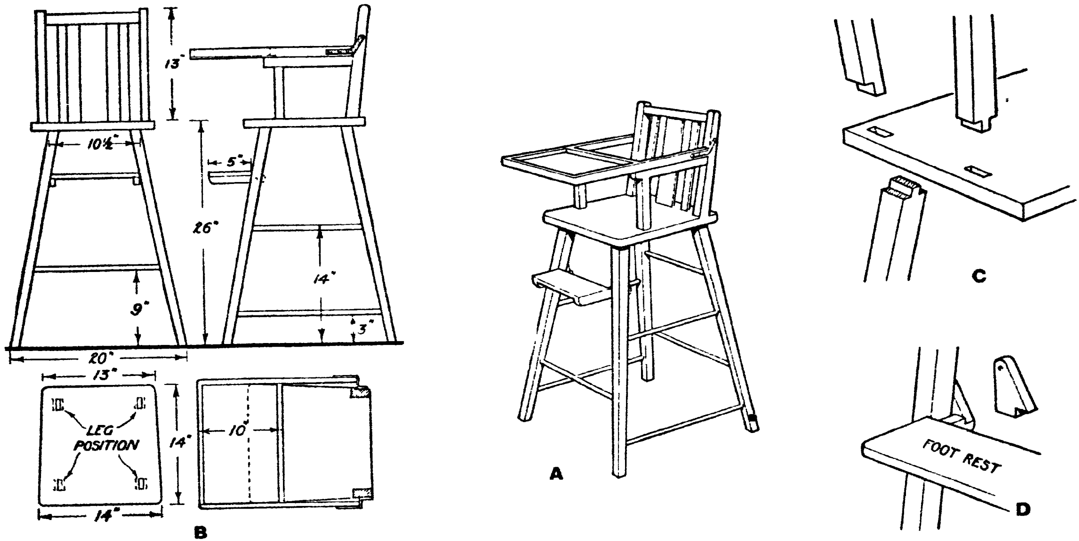


FIG. 307.

A. Child's high chair.
C. Details of seat joints.
B. Elevations and plan of chair.
D. Foot-rest fixing.

to the seat. If cramps are short, however, glue the top rail to the uprights and allow the glue to set before adding the slats. Arms and their supports follow. Skew shoulders are needed where the arms join the back.

The tray is made up as a complete unit. The front rail is dovetailed to the sides and the back rail inserted in grooves. A plywood bottom is glued and nailed beneath. Normally cranked plates can be obtained for pivoting the tray as shown in *A* and *B*. In any case it is not difficult to cut out a pair from brass. Fig. 307, *D*, shows the foot-rest details. It is a piece of $\frac{1}{2}$-in. stuff with cross-pieces fixed beneath at the ends. Round-head screws passed through the ends into the legs serve to pivot it, and little catches of wood hold it in the horizontal position as shown. Round over all angles and corners and finish with either paint or varnish. Note that the lower ends of the legs will have to cut at an angle so that they bed flat on the floor. A straight-edge passed across them at each side will show the angle. Chamfer the corners, and knock on a glider to each.

Cutting List

	Length.	Width.	Thickness.
4 Legs . . .	2 ft. 3 in.	$1\frac{3}{8}$ in.	$1\frac{3}{8}$ in.
1 Seat . . .	1 ,, $2\frac{1}{2}$,,	$14\frac{1}{4}$,,	1 ,,
1 Foot-rest . .	11 in.	$5\frac{1}{4}$,,	$\frac{1}{2}$,,
2 Pieces . . .	7 ,,	1 ,,	$\frac{7}{8}$,,
2 Back uprights .	1 ft. $2\frac{1}{2}$ in.	$1\frac{3}{4}$,,	$\frac{7}{8}$,,
1 ,, rail . .	1 ,, 1 ,,	$1\frac{5}{8}$,,	$\frac{7}{8}$,,
1 Slat . . .	1 ,, 1 ,,	$3\frac{1}{4}$,,	$\frac{1}{2}$,,
2 ,, . . .	1 ,, 1 ,,	$1\frac{1}{8}$,,	$\frac{1}{2}$,,
2 Arms . . .	1 ft.	$1\frac{1}{4}$,,	$\frac{7}{8}$,,
2 Arm posts . .	8 in.	$1\frac{1}{4}$,,	$\frac{7}{8}$,,
2 Tray sides . .	1 ft. $7\frac{1}{2}$ in.	$1\frac{1}{4}$,,	$\frac{1}{2}$,,
2 ,, rails . .	1 ,, 4 ,,	$1\frac{1}{4}$,,	$\frac{1}{2}$,,
1 ,, bottom .	1 ,, 4 ,,	$10\frac{1}{4}$,,	$\frac{3}{16}$-in. ply
$\frac{1}{2}$-in. dowelling for rails.			

Nursery Furniture

These three items should prove useful to the man who is able to set aside a room for a nursery. All of them can be made up from a cheap hardwood and plywood and be painted or enamelled. A two-colour scheme could be adopted in the painting, and nursery-rhyme or animal transfers could be applied if desired. The construction is so straightforward that little is needed in the way of explanation.

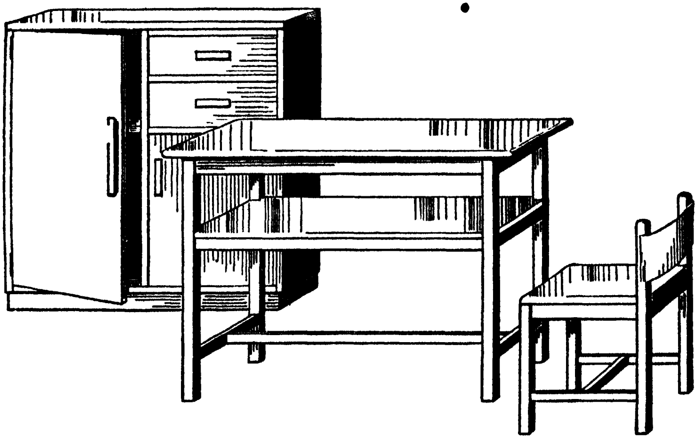


Fig. 308.—Nursery Table, Chair, and Toy Cupboard.
They can be made up in any hardwood and plywood, and finished with enamel.

THE TABLE

The small legs are mortised for the tenons of the rails as they occur. Note here that the bottom rail (Fig. 309) is a stretcher tenoned to the cross end rails (*E*). The shelf, which may be of ½-in. plywood, is cut at the corners to fit round the legs, the edge being kept flush with the outer faces of the legs. The top may also be of plywood (⅝ in. or ¾ in.) screwed in position through the rails.

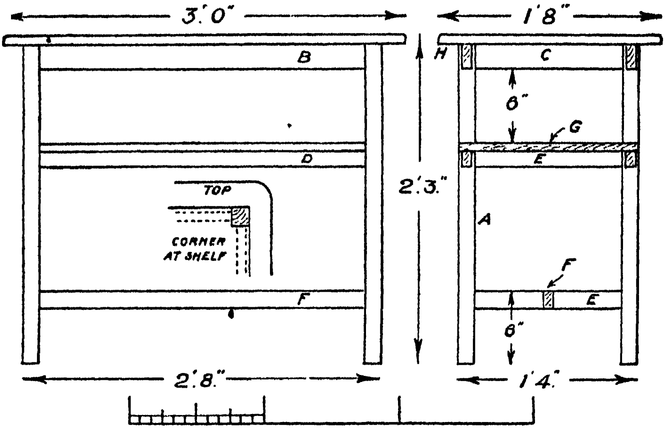


FIG. 309.—ELEVATIONS OF NURSERY TABLE.

The corners of top should be rounded as indicated in the inset plan at Fig. 309. The top edge should also be rounded, and all sharp corners on legs, rails, and shelf should be eased with glasspaper. The height of table is given as 27 in., but this may be varied from 20 in. to 28 in., according to the age of the child. The height may at any time be increased by the addition of castors.

If the table is not to be painted, the plywood edges will have to be lipped with solid hardwood strip ¼ in. thick.

CUTTING LIST

Table

	Length.	Width.	Thickness.
4 Legs .	2 ft.	1½ in.	1½ in.
2 Top rails	2	2	
2 „	1	2	
2 Under-rails	2	1¼	
4 „	1	1¼	
Stretcher rail	2	1¼	
Shelf .	2	16	½-in. ply
1 Top .	3	20	¾ „ „

THE TOY CUPBOARD

In the best way the carcase top and bottom will be dovetailed to the ends. If the bottom (Fig. 311) is

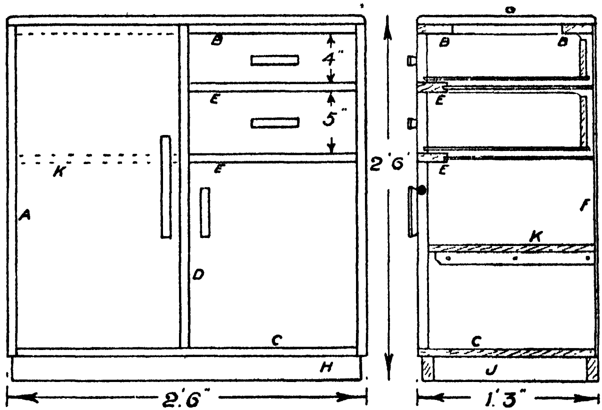


FIG. 310.—NURSERY TOY CUPBOARD.

dovetailed on in the usual way, the top (*G*) may be screwed through the top rails (*B*) and additionally held by glued blocks at the ends. The ends are rebated for the plywood back. The partition (*D*) is tenoned to the bottom; at the top it is notched to engage the rails (*B*), to which it will be screwed. Note that, on account of the door, the front top rail (*B*) is cut back at the left as shown in Fig. 310. The top rails are dovetailed to the ends. The plywood back (*F*) finds a bearing on the top rail and on the bottom. The two inside shelves (*K*) may rest loose on fillets.

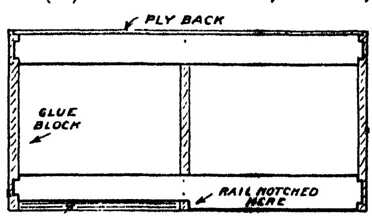


FIG. 311.—PLAN OF CUPBOARD.
Showing front and back top rails.

The plinth parts (*H*, *J*) may be mitred or tongued at the corners and strengthened with glued blocks. The plinth stands in a full ¼ in. at front and ends.

The doors may be of ½-in. or ⅝-in. plywood. For sound wear the edges should be lipped with solid strips $\frac{3}{16}$ in. thick. The drawer fronts should be of ¾-in. wood, using ⅜-in. for sides and backs, and plywood for bottoms. Provide wood handles, screwed from behind, and fit a ball catch to each door.

CUTTING LIST

Toy Cupboard

	Length.	Width.	Thickness.
(*A*) 2 Ends . . .	2 ft. 4 in.	15 in.	¾ in.
(*B*) 1 Top rail (front) .	2 ,, 6 ,,	3 ,,	¾ ,,
1 ,, (back) .	2 ,, 6 ,,	2½ ,,	¾ ,,
(*C*) 1 Bottom . .	2 ,, 6 ,,	15 ,,	¾ ,,
(*D*) 1 Partition . .	2 ,, 4 ,,	15 ,,	¾ ,,
(*E*) 2 Drawer rails .	1 ,, 4 ,,	2½ ,,	¾ ,,
(*F*) 1 Back . . .	2 ,, 6 ,,	28 ,,	¼-in. ply
(*G*) 1 Top . . .	2 ,, 6 ,,	15 ,,	¾ in.
(*H*) 2 Plinths . .	2 ,, 6 ,,	2 ,,	⅞ ,,
(*J*) 2 ,, . .	2 ,, 3 ,,	2 ,,	⅞ ,,
(*K*) 2 Inside shelves .	1 ,, 2¼ ,,	14 ,,	½-in. ply
1 Door (left) . .	2 ,, 3½ ,,	14 ,,	⅝ ,,
1 ,, (right) .	1 ,, 3½ ,,	14 ,,	⅝ ,,
1 Drawer front .	1 ,, 2¼ ,,	4 ,,	¾ in.
1 ,, ,, .	1 ,, 2¼ ,,	5 ,,	¾ ,,

Drawer sides, backs, and bottoms, etc., are extra.

SMALL CHAIR

All rails are tenoned, and it is wise to screw hardwood angle braces to legs and rails immediately under the seat. A comfortable back is provided by means of a piece of stout striped canvas, about 5 in. wide, fixed to the back leg either as at *X* or *Z*, Fig. 313. The inner corner of the leg at this part should be rounded off comfortably. The front legs and front corners of the seat should also be rounded off, and all sharp corners eased with glasspaper.

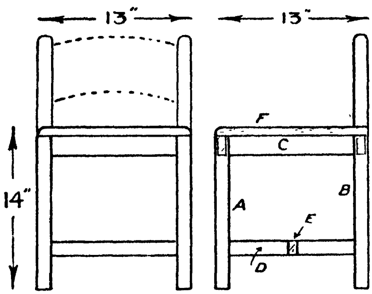


FIG. 312.—CHILD'S CHAIR WITH MAIN SIZES.

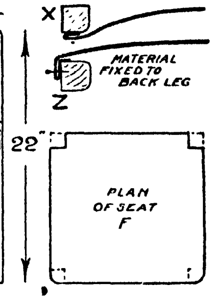


FIG. 313.—SEAT AND BACK DETAILS.

The height of the seat from the floor may vary from 12 in. to 18 in., according to age of child.

CUTTING LIST
Small Chair

	Length.	Width.	Thickness.
(*A*) 2 Front legs .	1 ft. 2 in.	1¼ in.	1¼ in.
(*B*) 2 Back „ .	1 „ 10 „	1¼ „	1¼ „
(*C*) 4 Rails . .	1 „ 1 „	1½ „	⅞ „
(*D*) 2 „ . .	1 „ 1 „	1¼ „	⅞ „
(*E*) 1 Stretcher .	1 „ 0 „	13 „	⅝ „
(*F*) 1 Seat . .	1 „ 1¼ „	13¼ „	¾ „

PLAY PEN

This is a very simple piece of woodwork, and takes little timber, since only strips are needed. The whole thing is put together with mortise and tenon joints, and, as the mortise width equals the timber thickness, there are no side shoulders to cut. Shoulders are necessary at the edges because the corners are rounded, but these are easily cut. Note that there are six frames: two large ones and four small ones. The last named are hinged together at the middle so that the pen will fold flat as shown at *C*,

Fig. 315. Simple metal bars with a hole at one end and a slot at the other (*F*) serve to keep the frames square, the slot fitting over a round-head screw. Any softwood which is free of knots can be used.

Prepare the top and bottom rails to the sizes given in Fig. 315, and plot out the positions of the mortises, spacing them equally. The upright slats are $\frac{3}{4}$ in. wide, but,

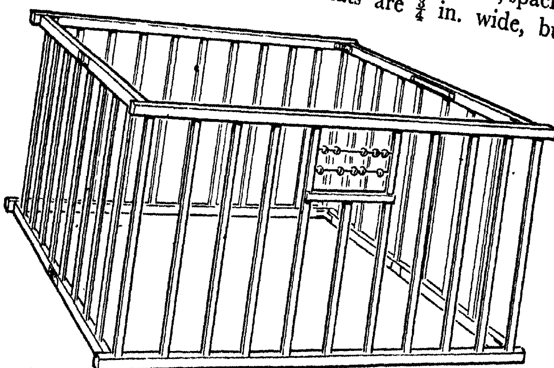


FIG. 314.—PLAY-PEN, SIZE 4 FT. BY 3 FT. APPROXIMATELY.

since side shoulders are needed, the mortises must be only $\frac{1}{2}$ in. long. One long frame has a bead-rack, and this means that the top rail has no centre mortise. As the rails are $1\frac{1}{4}$ in. deep, the mortises might be $\frac{3}{4}$ in. to $\frac{7}{8}$ in. deep. Make all the same depth, glueing a piece of paper to the chisel as a guide. When the mortises have been cut the top edges can be rounded over.

Cut off all the slats to the same length, allowing for the tenons, and mark the shoulders on one. All the remainder can then be fixed together in sets and marked out from this same one. The extent to which they are cut away to form the tenons can be marked with gauge. Cut them,

and round over the corners. If the work has been accurate, no individual fitting should be necessary, but if in doubt they can be tried together. Glue up the frames, testing for

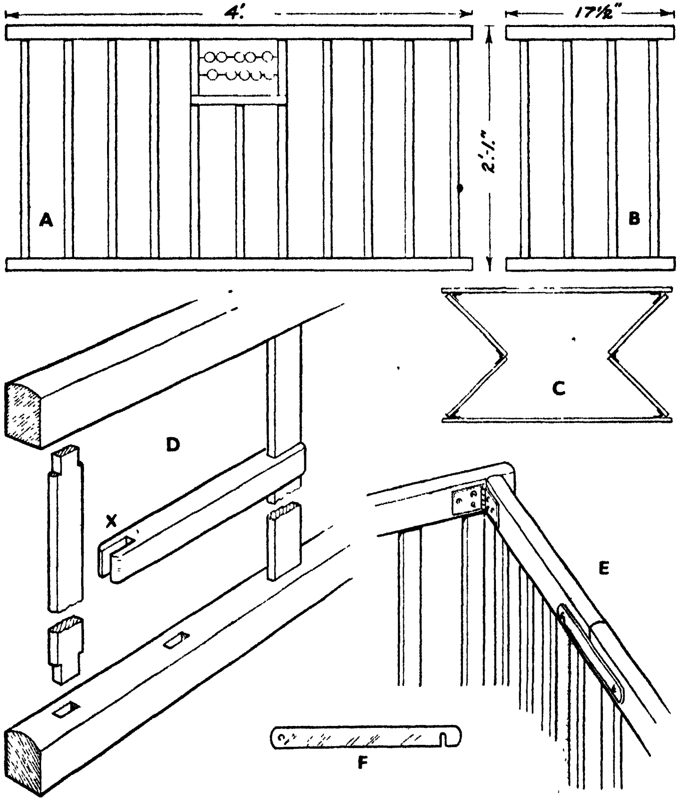


FIG. 315.—SIZES AND CONSTRUCTION DETAILS OF PLAY-PEN.

squareness and being sure that they are free from winding. In the case of the long frame with the bead-rack, the short slat can be added afterwards. It fits at the top into the short cross-piece which is slotted at the ends to fit over the

long slats. After glueing, a nail can be driven through each slotted end. The beads fit over stout wires which pass through holes drilled in the slats. There is enough give in the wire for this to be slipped in afterwards.

The hinges for the frames are not let in, but are screwed straight on. If preferred the wood can be finished with paint, but many people prefer to leave it in the white.

CUTTING LIST

	Length.	Width.	Thickness.
4 Rails . .	4 ft.	$1\frac{1}{4}$ in.	$\frac{7}{8}$ in.
8 ,, . .	1 ft. $5\frac{1}{2}$ in.	$1\frac{1}{4}$,,	$\frac{7}{8}$,,
37 Slats . .	2 ,, $\frac{1}{4}$,,	$\frac{3}{4}$,,	$\frac{3}{8}$,,
1 ,, . .	1 ,, $5\frac{1}{4}$,,	$\frac{3}{4}$,,	$\frac{3}{8}$,,
1 Slotted piece .	$10\frac{1}{2}$ in.	$\frac{7}{8}$,,	$\frac{7}{8}$,,

All the above are finished sizes.

CHAPTER XII

INTERIOR FITMENTS

Pelmets in Wood

A wooden pelmet makes an extremely attractive finish to a window. It can be made of the same wood as the furniture or other woodwork in the room, and a complete decorative scheme can thus be carried out. Three attractive designs are given in Fig. 316, and any of them could be adapted to suit any special scheme. Plywood is used for all the show parts, this having the advantage that, being free from shrinkage, it can be used in long strips with the grain running crosswise. Furthermore, it can normally be obtained ready veneered in a great variety of woods, enabling some very attractive designs to be produced. If desired, plain birch ply could be used only, this being stained in varying depth to give the effect of different woods.

The construction of that at *A*, Fig. 316, is given in Fig. 317. The length can be fixed in accordance with the particular window for which it is required. It is advisable to allow it to project beyond the architrave about 3 in. at each side, so that the curtains cover well. The depth might be 4 in., this being ample to allow the wheel type of runners to be fixed.

First prepare the two side pieces, making them 9 in. by 4 in. At the top front edge a notch is cut to allow the front rail to be fixed. This rail is $\frac{1}{2}$ in. thick, but the notch is made $\frac{3}{16}$ in. deeper, so that the strip of $\frac{3}{16}$-in. ply, *A*, can be fitted in flush. The top finishes flush with the notch and is fixed with glue and nails. The front rail can then be screwed on as shown.

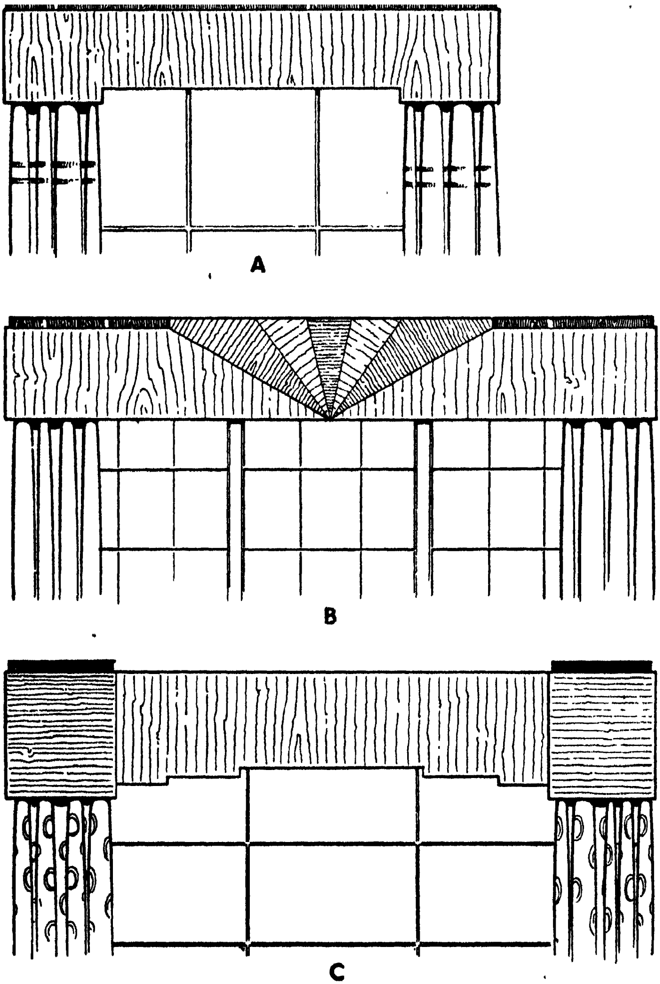


FIG. 316.—DESIGNS FOR SIMPLE PELMETS IN WOOD.
The show parts are in plywood fixed to a solid framing.

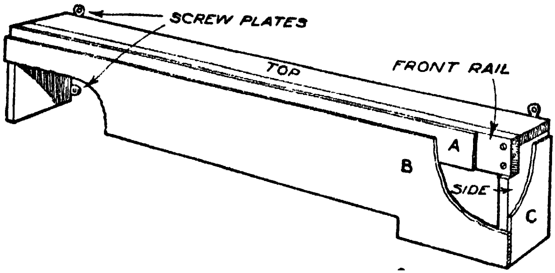


FIG. 317.—CONSTRUCTION OF PELMET *A*.

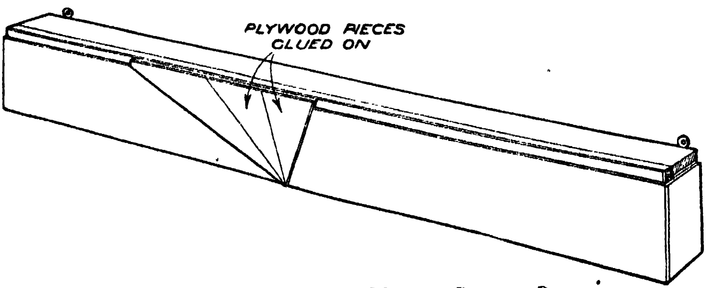


FIG. 318.—METHOD OF MAKING PELMET *B*.

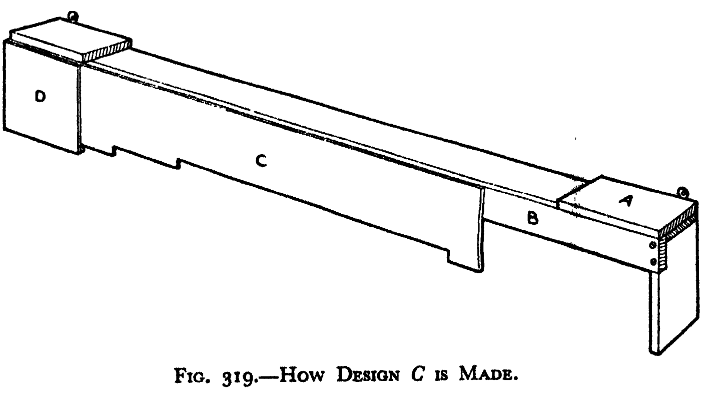


FIG. 319.—HOW DESIGN *C* IS MADE.

Now cut out the strip of plywood *A*, and fix it with glue and fine nails. Two pieces of ply, *C*, are fixed to the sides, the height of these being arranged so that they finish level with the front piece *B*. The latter is notched out at the bottom edge. The length of the projecting pieces can be arranged so that the curtains fit behind them as in Fig. 316. It then remains but to polish the whole. If birch ply is used throughout, it is advisable to stain the parts before assembling, so that the strip *A* can be stained a darker shade without over-running. The track for the runners is fitted with brackets, which are screwed to the under-side of the top. The whole thing is fixed to the wall with screw plates.

The design at *B*, Fig. 316, is made similarly so far as the back framework is concerned. The only difference is that the centre decorative effect is obtained by glueing and nailing on the tapered pieces. Take care to keep the grain of these balanced. At the top a narrow strip of ply is fixed where the tapered pieces overrun the narrow frieze. The pelmet is suitable for a wide window.

The last design, *C*, Fig. 316, is made as shown in Fig. 319. The back framework is similar to the others, but at the top at both ends the pieces *A* are fixed on. These form the friezes of the ends. The edges can be stained dark as shown.

Simple Ways of Panelling a Room

Panelling is one of the oldest forms of wall covering in a room, and it is one of the most successful. For one thing, it has a delightful appearance, but the matter goes farther than that. It has been proved that a panelled room becomes warm more quickly than one with plain walls, and it retains its heat much longer. Wood is an excellent insulator, so that the heat cannot escape except through such places as the windows.

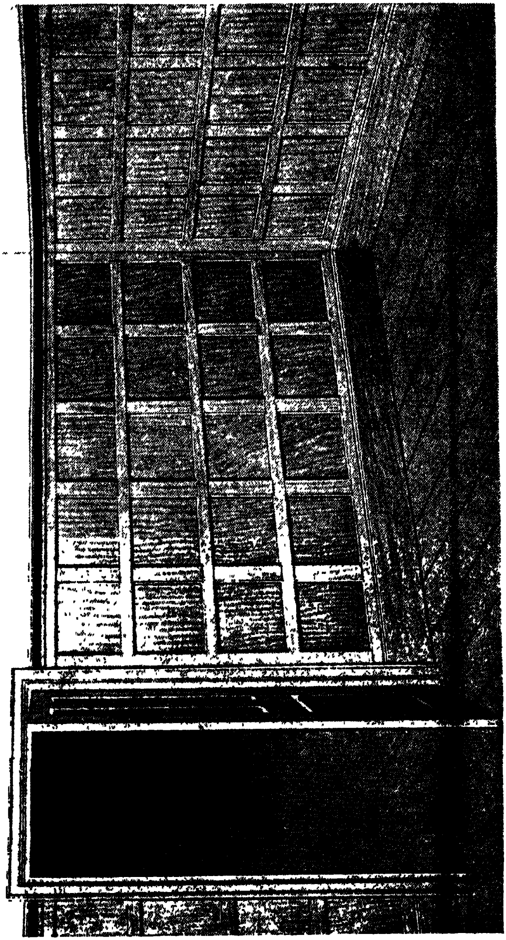


FIG. 320.—PANELLED OUT IN JACOBEAN STYLE.
Plywood panels are fixed to the wall and strips to form the framing are applied. By preparing a special jig the various parts can all be cut to size without the necessity of measuring every part.

Now, the old method of panelling was to make up a framework of rails and stiles joined together with mortise and tenon joints. All these parts were grooved at the edges to hold the panels. The method was a perfectly sound one, but it is hardly practicable for the present-day amateur, with his small workshop, limited kit of tools, and still more limited time. The preparation of the materials, joint cutting, and so on would take a tremendous time, certainly more time than the average man would feel justified in giving to the task.

A SIMPLE METHOD

Fortunately, the introduction of plywood has solved the difficulty, enabling the panelling to be carried out in a very simple way. There are various reasons for this. One is that plywood will not shrink, so that the chief reason for the framed-up system no longer holds good. Another is that plywood is obtainable in wide sheets, so that a great deal of jointing-up is avoided.

The method briefly is to fix up sheets of plywood to the wall, and to the surface of this apply strips of solid wood in imitation of the framing. The last-named is so arranged that the strips cover the joints in the ply. There is no need for each panel to be a separate piece of ply. It is much simpler to fix up large sheets of ply, so that each occupies the space of four or even more panels. In fact, this last consideration is the first one that should be thought out when scheming out a room. The standard sizes in which the panels can be obtained should be kept in mind, so that a great deal of trimming and consequent waste is avoided. These sizes vary to some extent, and should be ascertained definitely from the local supplier before the work is started.

The following are a few standard sizes: 60 in. by 48 in.; 48 in. by 48 in.; 48 in. by 24 in.; 36 in. by 36 in.; 36 in.

by 24 in.; 24 in. by 24 in.; and so on in smaller sizes down to 12 in. square. Sometimes a combination of two sizes works in very conveniently. A thickness of $\frac{3}{16}$ in. is usually the best to use, and either a plain birch surface or one veneered with oak or walnut can be used. The birch is cheaper, but the oak gives a much finer effect, and is in keeping with the old style.

When a house has been standing some years, it is safe to apply the plywood direct to the plaster walls, providing that these are reasonably level. In the case of a new house, however, it is better to fix up first a series of deal battens and fix the plywood to this. It provides a space at the back and lifts the plywood away from the plaster, which is still probably damp. In any case it is advisable to coat the backs of all panels with a bituminous paint to protect the wood from the damp.

Whether the house is new or old often affects the design of the panelling. When it is new one usually has a fairly free hand, but in the case of an old house such details as the skirting, picture-rail, and so on have to be considered—unless one is prepared to scrap these. Generally, however, there is no great difficulty; all it means is that the picture-rail controls the height of the panelling.

PANELLING OF THE OLD STYLE

A suggestion for a panelled room in the old style is given in Fig. 320. In this it is assumed that there is a picture-rail and skirting already fixed. The first step is to plot out the positions in which the framing-rails are to be fixed. Since in the present case all the panels are of the same size, it is convenient to fix up square sheets of plywood, two making up the height as shown in Fig. 321. It nearly always happens, of course, that as a corner is reached a special size of ply has to be cut to fit, but it is simpler to arrange the bulk of the panels to the same

standard size, and allow those at the corners to be whatever they will.

The ply can be fixed up with panel pins about 1 in. long. These do not grip plaster very strongly, but it

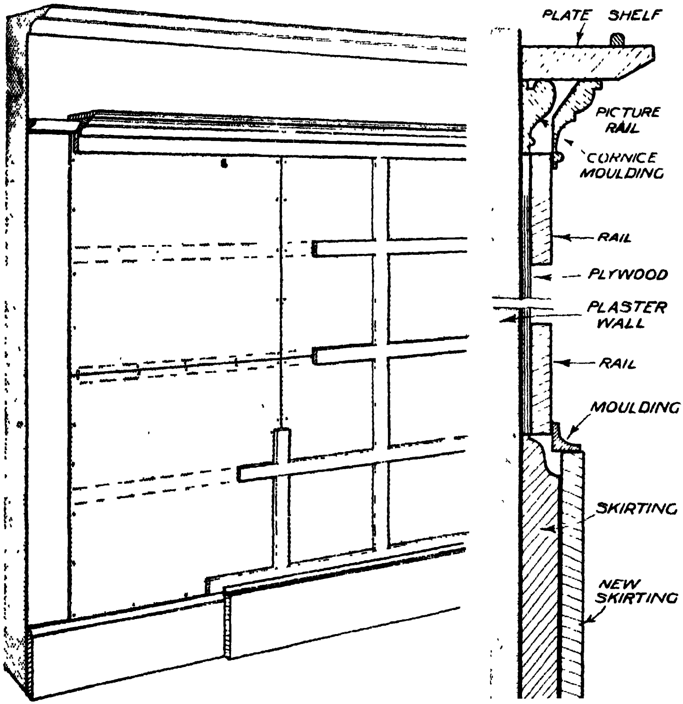


FIG. 321.—HOW PLYWOOD PANELS ARE FIXED TO WALL. Shows also how the framing rails are applied over them.

must be remembered that there is no great strain on the panelling. In any case there are plenty of nails, and if they are driven in at an angle in alternative directions, they will have a strong dovetail grip. They should be placed close to the edges, so that the battens cover them.

Upon the panels so erected the position of the framing rails can be marked out. These can be $\frac{3}{8}$ in. thick by 2 in. to $2\frac{1}{4}$ in. wide. First fix a pair of uprights at each corner and against such parts as the door, architrave, windows, and so on. Between them the horizontal members are butted, these running in continuous lengths; but, to ensure a good fit at the joints, each horizontal should be fitted above its uprights. In this way the bottom horizontal is fixed first, and the bottom row of uprights nailed above it. The next horizontal follows, and above it the next row of uprights, and so on until the picture-rail is reached.

The advantage of this method is that it saves a great deal of unnecessary fitting and enables all the uprights to be cut off to a standard length. This is done by using the square cut in the mitre box and fixing a stop. Thus, having cut one end square, the wood is pressed up against the stop and the new cut made. Any number of pieces can be cut off square to the same length in this way. Fig. 322 shows the idea. The rails are nailed on and the nails punched in and the holes filled with plastic wood.

It is desirable to cover up the picture-rail, because it is out of keeping and stands in too far. This can be done by nailing above it a plate-shelf as shown in Fig. 321. Beneath it any suitable cornice moulding can be nailed. A strip fixed above the shelf serves to prevent the plates from slipping forwards. At the bottom a new skirting strip is nailed along, and a moulding is added at the angle to give a neat finish as shown.

Fig. 323 shows the arrangement to be followed in the case of a new house in which the plaster is new. Battens are fixed up first to raise the plywood from the wall. These are arranged to follow the same line as the rails forming the framework. An altogether stronger fixing is possible. The walls can either be plugged to enable screws to be

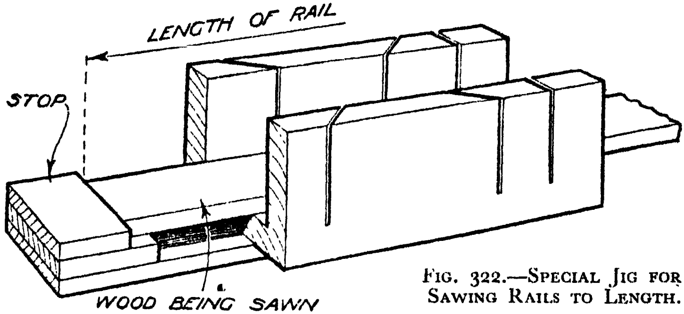
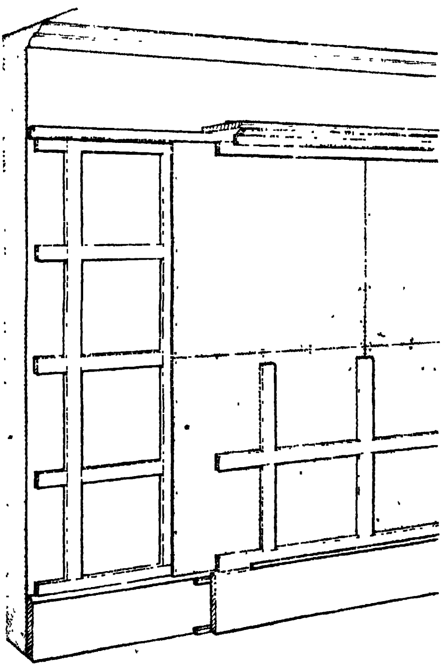


FIG. 322.—SPECIAL JIG FOR SAWING RAILS TO LENGTH.



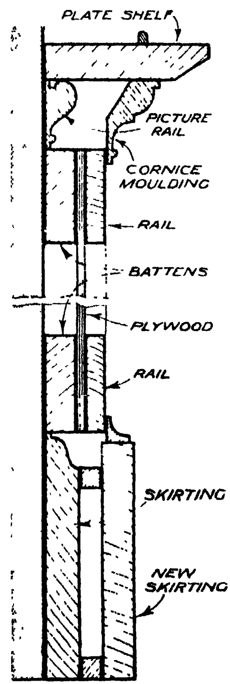


FIG. 323.—FIXING PRELIMINARY BATTENS TO WALL. This is advisable in the case of a new house.

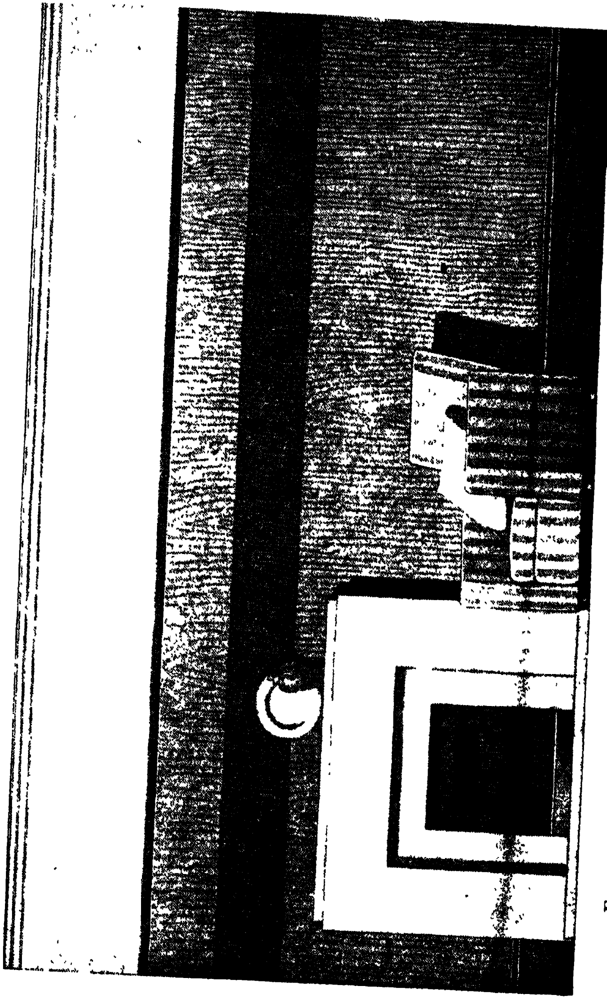


FIG. 324.—ROOM PANELLED IN MODERN STYLE WITH HORIZONTAL BAND OF WALNUT.
The main part of the panelling is in oak. For a less expensive scheme birch ply could be used, the horizontal band being stained a darker shade than the rest.

driven in, or Rawlplugs can be used. Thus when the plywood and rails are added they have a strong, firm fixing.

In a general way the procedure is the same as before. The battens are screwed up first and the plywood and rails nailed to them. As, however, there is the extra thickness of the battens to be allowed for (they are $\frac{1}{2}$ in. or $\frac{3}{4}$ in. thick), a slightly different arrangement has to be made at top and bottom. Fig. 323 shows this. Note that at the bottom, strips have to be nailed to the existing skirting so that the new skirting stands out sufficiently from the panelling.

A MODERN SCHEME

The modern type of panelling has come about through a candid realisation that the framing strips, when applied to plywood, are wholly unnecessary and are sham. As a consequence the framing pieces are often omitted entirely, leaving a large, plain surface free from all breaks. Merely to fix sheets of ply in this way, however, would produce an uninteresting effect, and to overcome this various kinds of wood are often introduced, or certain parts are stained a darker shade than the rest.

Fig. 324 shows such a scheme. It consists really of three horizontal bands, the centre one being either of walnut (the others are oak), or stained a darker shade than the rest. It would not be practicable, of course, to obtain the ply wide enough to stretch right across the room, so it is put up in rectangles side by side, the joints being planed to be close and unnoticeable. The fixing-nails are all punched in and the holes filled in with plastic wood.

Fig. 325 shows the method of fixing the panelling. A series of horizontal battens is fixed to the wall with screws, their positions being such that they will be immediately behind the joints. In accordance with the width of panels being used, upright battens must also be fixed to

give a fixing for the nails. Note that at the top the plywood stands down about 1 in. to 1½ in. to give a frieze effect. The batten must be positioned accordingly, and to make a good job it should be of oak.

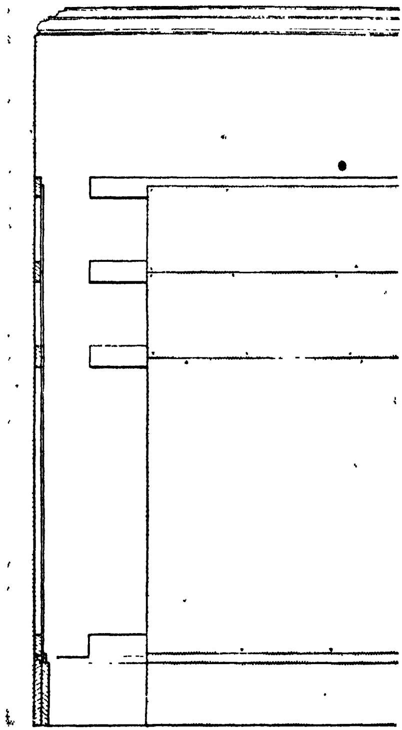


FIG. 325.—MODERN PANELLING.
How plywood panels are fixed to battens.

When the panels have been fixed, the joints can be lightly rubbed down with fine glasspaper and any cracks filled in with plastic wood. At the base a new skirting-piece is fixed on, and above it a strip about ¾ in. by ¼ in. is fitted to make a sort of square moulding.

FINISHING THE PANELLING

The panelling can either be left in its natural colour or it can be stained. Any of the proprietary stains give a reliable result. Afterwards the whole can be waxed. It is advisable to rub down the surface with a coarse rag after staining when certain proprietary stains of an oily nature have been used; otherwise there may be a deposit which will prevent a nice polish from being obtained. The polish can also be one of the many proprietary brands, or it can be made by shredding together beeswax and a little carnauba wax. This is dissolved in turpentine to form a paste. It is applied with a brush and left for about twenty-four hours so that the turpentine can evaporate. It is then polished with a brush (a clothes brush does very well) and finished off with a cloth rubber.

Making a Parquet Floor

A parquet floor is one of the most serviceable forms of floor, and it is certainly one of the most attractive. The initial cost is rather more than that of linoleum, though if the reader does the work himself there is not a great deal in it. Since it gives almost everlasting wear, it is probably more economical in the long run. The work is not difficult; it merely requires the ordinary care that any job in woodwork calls for if it is going to be successful.

It consists of laying thin blocks of wood ($\frac{3}{16}$ in.) down on to the existing floor and fixing them with glue and nails. A standard size of block is adopted, so that all can be cut up automatically to size, thus saving a great deal of unnecessary measuring up and marking out. On this score it is possible to obtain ready-made blocks specially for the purpose, and their use saves a great deal of time. They naturally cost rather more than when the reader

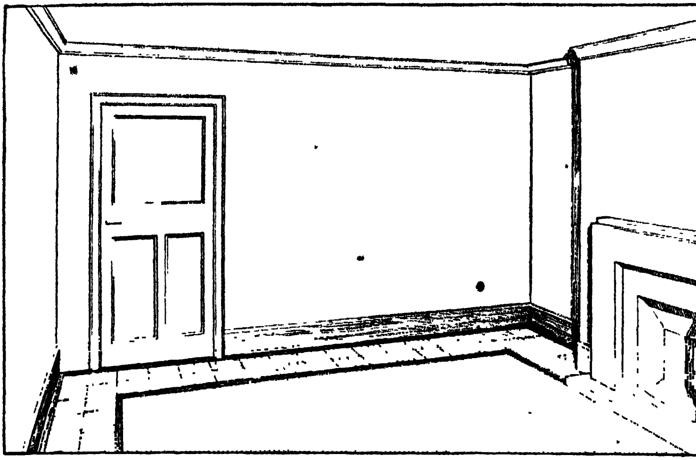


FIG. 326.—ROOM WITH PARQUET SURROUND AND CENTRE CARPET.
Any of the designs shown in Fig. 333 could be used.

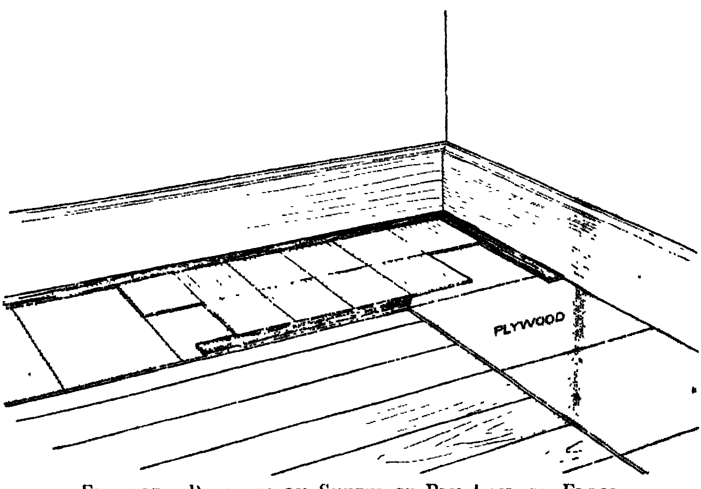


FIG. 327.—PRELIMINARY SHEETS OF PLY LAID ON FLOOR.

cuts up all his material, and which is the better for his purpose is a point he can decide for himself.

The first consideration is that of the existing floor itself. If this is in reasonably good condition the blocks can be laid staight on it, though in any case a certain amount of levelling will be needed. A smoothing-plane can be used, such parts as the joints calling especially for attention.

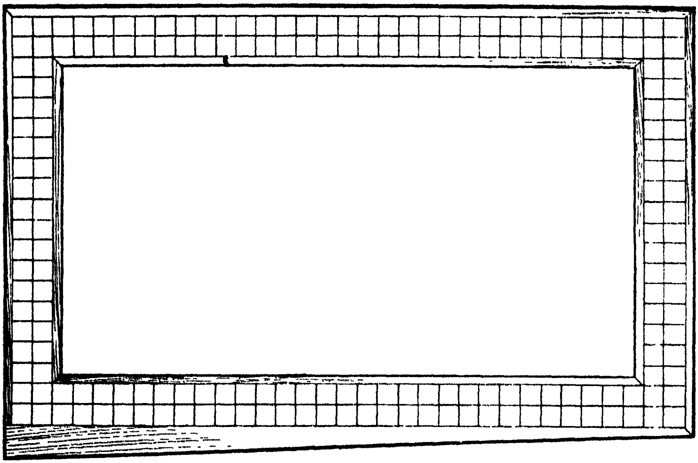


FIG. 328.—HOW ROOM WITH WALL OUT OF SQUARE CAN HAVE SURROUND LAID TRUE.

All nails should be punched in so that the plane-cutter is not fouled, and the floor should be well swept, because dust takes off the edge of a plane quickly. At the extreme edges round the skirting a rebate-plane can be used. When only a surround is to be covered with parquet, the levelling need be done locally only.

If the floor is in really bad condition, it is advisable to put down sheets of $\frac{1}{8}$-in. or $\frac{3}{16}$-in. plywood first as shown in Fig. 327. Even here, however, a preliminary levelling is desirable, so that the ply beds down reasonably well.

The size of the ply panels should be calculated so that the border exactly covers them (Fig. 328). There will thus be a sort of step down in the centre in which the carpet will lie.

Now, all rooms are not exactly square, but the carpet is rectangular. It is therefore advisable to work to a rectangle marked out in the centre. Then if one of the walls slopes away towards one corner, the outer line of the

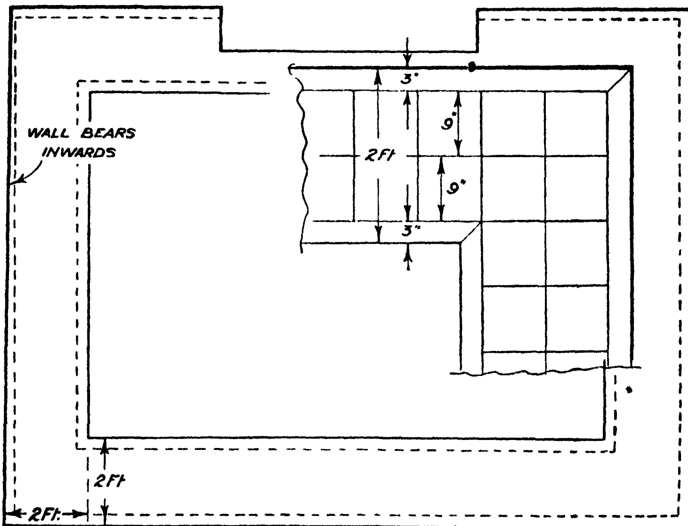


FIG. 329.—HOW ROOM IS MARKED OUT FOR A 2-FT. SURROUND.

border can be made to taper at the skirting. This is made clear in Fig. 328, which shows the advantage of having a plain strip at the outside. It means that the pattern itself can be made square, thus saving a great deal of trimming.

MARKING OUT

Having decided upon the pattern of the border, the first operation is to mark out on the floor the centre rectangle.

Assuming that the border is to be, say, 2 ft. wide (see inset in Fig. 329), there can be two squares 9 in. wide placed side by side, and a plain border strip at each side 3 in. wide, making up the 2 ft. Such parts as breaks in the wall caused by the mantelpiece can be ignored, the pattern running straight through as in Fig. 329. If one wall runs slightly out of square, possibly to the extent of, say, 2 in., the line marking the border should be at 2 ft. at the widest part, so that the wall slopes in on the border. If this is not done there will be a gap when the widest part is reached. If, however, the wall is only about 1 in. out of true it can be ignored, because a moulding can be fitted against the skirting as explained later.

Now, it is desirable to have an exactly equal number of 9-in. panels along each side, and it may be necessary to allow a little latitude in the width of the outer border. It may be either more or less than 3 in. to make up the exact number, but it is better to have a difference in the width of this outer border than to have to patch up the corners with panels of odd size.

CUTTING THE BLOCKS

If the reader decides to purchase the blocks ready made the work can proceed straightway. Otherwise it will have to be prepared. The wood should be obtained ready thicknessed, and it is an excellent plan to have it sawn to the required widths. In this case there will be one width of 9 in. for the square panels and one of 3 in. for the borders. To enable it to be cut to size a special cutting-block should be prepared. This is shown in Fig. 330. It is really a sort of mitre box, but extra wide, and with the base cut away where the saw is used. This enables the saw to be held at an angle.

When the cut is nearly completed the saw is held with the handle low down to avoid breaking off the corner.

Note that the front piece runs through to the right, so that the kerf in it acts as a guide to holding the saw upright. A stop is fixed to the left, and the dust should be cleared out of this, so that the wood beds well up against it. After sawing, the ragged edges at the underside should be cleaned with a piece of coarse glasspaper held on a block. The ordinary mitre box with a square cut can be used to cut off the long border strips. The

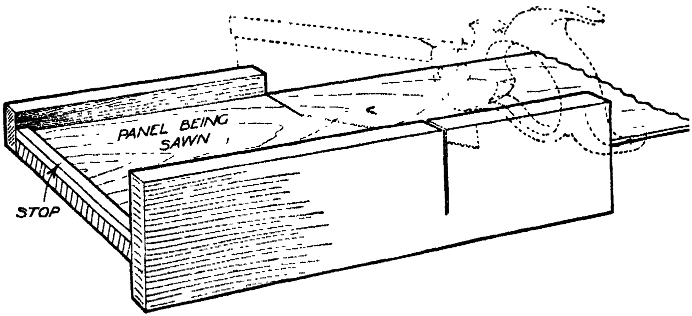


FIG. 330.—CUTTING-BLOCK FOR SAWING PANELS TO ABOUT 9 IN. SQUARE.

method necessarily takes time, especially as the lower ragged edges have all to be cleaned up, and most readers will probably prefer to obtain the wood ready made.

LAYING THE BLOCKS

The first step is to fix down the inner border strip against the line on the floor temporarily as shown in Fig. 331. The corners can be either mitred or butted. If desired, these border strips can be of darker wood—say, walnut. Alternatively the same wood stained dark can be used. In the latter case the staining should be done before the wood is laid. Use a good-quality proprietary stain, because it is essential that it drives well into the grain. A poor stain merely lies on the surface, and does

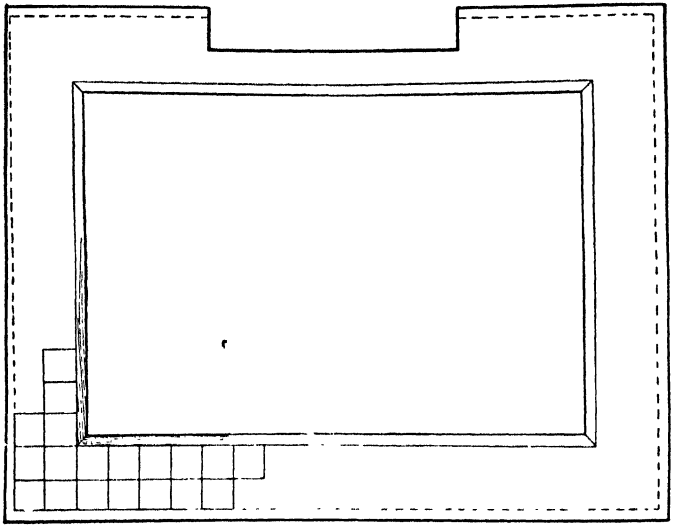


FIG. 331.—THE INNER BORDER IS FIXED DOWN TEMPORARILY FIRST.

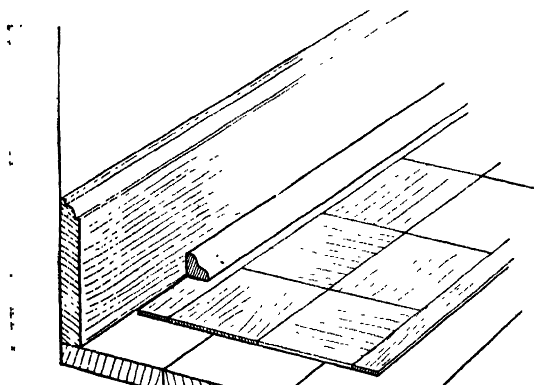


FIG. 332.—MOULDING FIXED AROUND SKIRTING.
This conceals any bad joints.

not wear well. If different kinds of wood are used, it is obviously essential that both are of the same thickness; otherwise there will be a great deal of levelling to be done. The length will be a multiple of 9 in., so that an exactly equal number of square panels can be fitted.

Begin at one corner and fit up the square panels level with the border as shown in Fig. 331. Proceed right along until the opposite end is reached. If it is found that they do not exactly meet the end of the inner border, the position of the latter can be altered a trifle to suit. It is for this reason that it was fixed down temporarily only.

Use nine nails for each panel, putting three at the sides and one in the middle. The nails can be 1 in. long, and it is a good plan to drive them in at an angle, so that they have a dovetail grip. Glue should be used also. Punch in the nails and fill in the holes with plastic wood. It is advisable to do this straightway.

The outer border follows, and it can be fitted in the space left. If neatly fitted, no moulding is needed. Otherwise the moulding shown in Fig. 332 can be added. When completed the whole should be rubbed over with glasspaper and finished with wax polish. One of the proprietary floor polishes will give a fine dull shine. One important point to note is that if the door opens inwards over the parquet, it will probably be necessary to take off a thickness at the bottom. To avoid complications the door should be unhinged before the parquet is laid, otherwise it may be difficult or even impossible to open the door.

Fig. 333 shows a few alternative designs for borders, and Fig. 334 a floor completely laid with parquet. When this is done, the centre portion can be laid first up to lines drawn on the floor. The inner border line then follows, and the rest of the surround in the way already described.

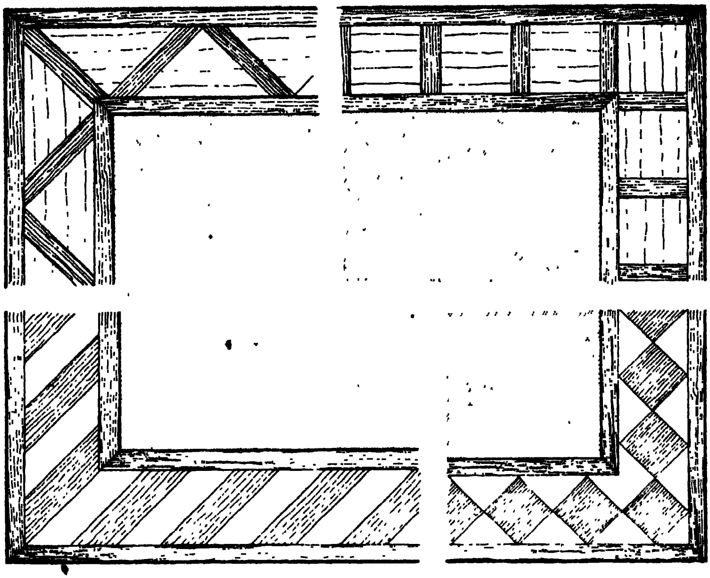


FIG. 333.—ALTERNATIVE DESIGNS FOR SURROUNDS.

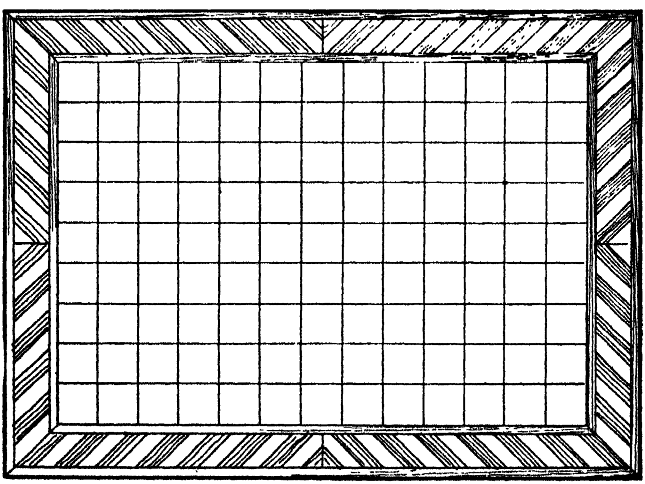


FIG. 334.—FLOOR COMPLETELY COVERED WITH PARQUET.

CHAPTER XIII

THE GARDEN AND GARAGE

1. Rustic Work

Some delightful additions to the garden can be made by means of rustic work. The cost is comparatively small and the work is simple. For the time expended some really imposing structures can be made. The tools needed are few, most of them being in the usual household kit. They include the handsaw, axe or billhook, hammer, pincers, chisel, and (for special work) spokeshave or gouge. The handsaw should preferably be of the type known as the farmer's saw. This has teeth with wide set, so that it clears easily in its cut. The timber is invariably wet, so that the ordinary handsaw is liable to bind. The axe or billhook is used for trimming off branches and for cutting joints. The chisel, too, is handy for joints. For taking off the sharp edges of timber where it has been sawn off the spokeshave is handy. The gouge or chisel also comes in for this.

THE JOINTS USED

Most of the timbers are held together with nails and occasionally with bolts, but, except for quite light work, it is always advisable to cut some form of joint; otherwise the whole strain falls on the nails. When a joint is cut, the nails serve rather to hold the parts in position. Joints are specially desirable for the larger structural members.

A few of the joints mainly used are shown in Fig. 335, though there are many varieties of them. That at *A* is a sort of splice used for joining pieces in their length. It

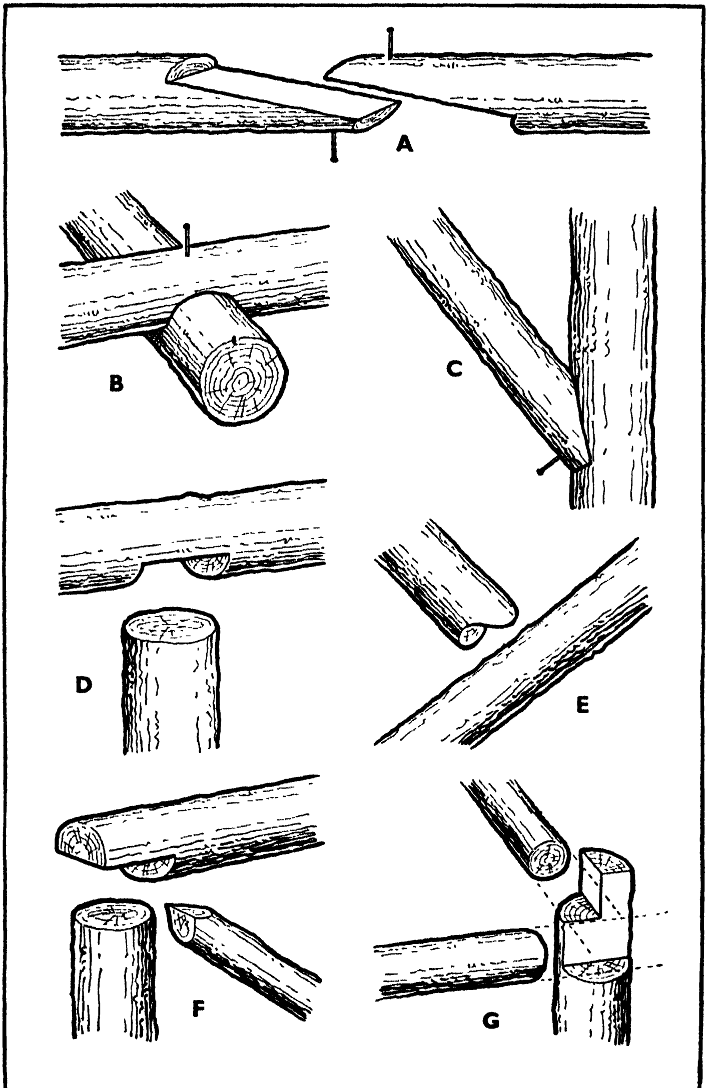
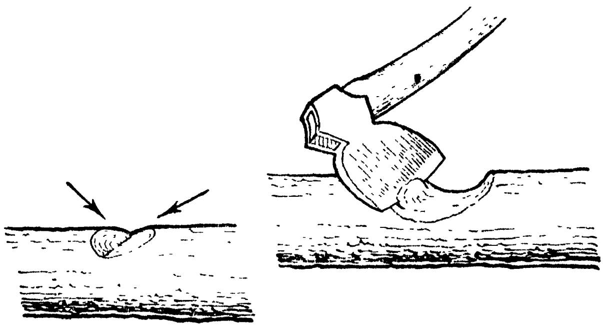


FIG. 335

could be cut entirely with the saw, or saw-cuts could be made across the grain and the waste chopped out with the axe or billhook. There is no need for the close accuracy necessary in ordinary carpentry, but the joining surfaces should fit approximately. Note that the cuts across the grain are slightly undercut, so that the joint resists any bending stress. Nails are used to hold the parts together.



A B

FIG. 336.—HOW ROUNDED NOTCHES ARE CUT.

When used for the horizontal of, say, a screen or pergola, it is an advantage to arrange the joint at the top of an upright, so that it has direct support.

Where two pieces cross at right angles, the joint at *B* can be used. The one piece is scooped out to a semi-circular shape so that the other rests in it. The axe can be used for this. Cuts are made at an angle first in one direction and then in the other, as shown in Fig. 336,

FIG. 335.—VARIOUS JOINTS USED IN RUSTIC WORK.

A. Spliced joint for joining pieces in their length.
B. Pieces at right angles.
C. Joint for strut.
D. Notched joint for pieces in T form.
E. Hollowed-out joint.
F. Two pieces at right angles, with diagonal strut.
G. A three-way joint.

until the wood has been cut away sufficiently. Here again an approximate fit only is needed.

C is handy for fixing diagonal struts. The upright is notched by making the short cut with the saw and cutting away the waste with the axe. The saw is used to cut the ends of the strut. Note how the joint itself resists the strain, the nails more or less keeping the strut in place.

For joining pieces in the form of a T, the joint at *D* can be used. The horizontal member is cut in for about one-third of its depth (not more), so that the upright fits into it. The notch is best cut by sawing the sides and chopping away the waste with the chisel. *E* is another joint used for a similar purpose. Here the end of the one piece is hollowed to fit over the other. In the first place, a V cut could be sawn, and this then finished with the gouge. Alternatively a bow-saw could be used.

Sometimes three pieces have to meet together, and then the joint at *F* is useful. The two main structural parts are the upright and the horizontal, the diagonal being merely cut to a point to fit in the angle. When all three have to be strongly joined, the method given at *G* is better. The way of cutting this is obvious.

GENERAL PREPARATION

All kinds of timber can be used, though branches of hardwood such as oak and elm are more durable. When a load is obtained, it is advisable to sort them out into approximate thicknesses, and to separate the straight from the curved branches. The last-named are often handy for struts and for designs requiring curved members. Smaller branches can be lopped off, though it is often handy to have pieces in which a branch forms a Y. It sometimes saves having to cut a special joint, and may strengthen the structure considerably.

Whether the bark is stripped off or not is a point the reader can decide for himself. The bark certainly affords greater protection, and so makes for durability. If it is stripped, it is advisable to give some protective coating, such as one of the special proprietary preservatives or a coat of varnish. An attractive effect can be obtained by leaving on the bark and finishing the exposed parts where the timber is sawn through with varnish. The bottoms of

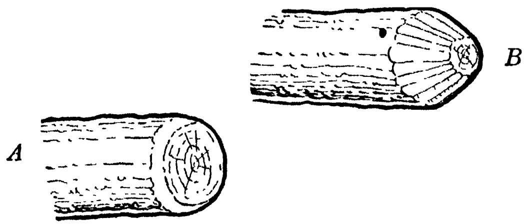


FIG. 337.—WAYS OF FINISHING ENDS OF POLES.

chair-legs and all parts touching the ground or embedded in it should be creosoted to prevent decay.

In addition to the ordinary branches, a certain amount of flat timber is needed for such parts as roofs, table tops, and so on. This need only be roughly dressed. Too fine a finish is out of place in rustic work. One last point is that large uprights should always be placed with the thicker end downwards to give greater stability.

TABLE

A simple piece of work on which to make a start is given in Fig. 338. It could stand some 2 ft. 4 in. to 2 ft. 6 in. in height, and the top could be about 2 ft. 6 in. by 20 in. Oak or elm boards are used for the top, these being roughly dressed and nailed down on to two cross-pieces. The last-named are made from a straight branch about 3 in. thick, sawn through the middle. By placing the

flat sides upwards, a good flat surface on which the top boards can be fixed is obtained.

The legs can be $2\frac{1}{2}$ in. or 3 in. thick, and are joined to the top cross-rails by the simple notched joint given at *C*, Fig. 335. Where they cross, the one piece is hollowed out. The two complete sides are put together independently,

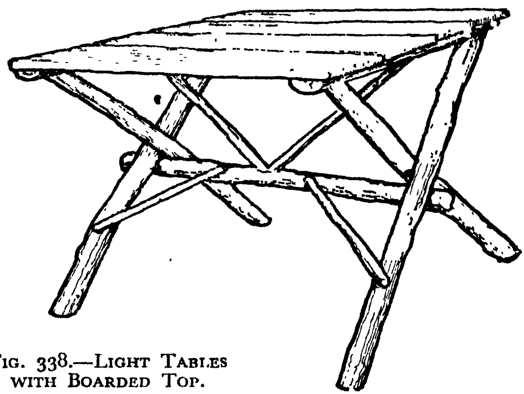


FIG. 338.—LIGHT TABLES WITH BOARDED TOP.

and are joined by means of the lower rail nailed beneath the intersection. The top boards follow, and finally the diagonal struts are fixed, so making the whole rigid. It is suggested that the top and the exposed ends of the rustic work are varnished, and the remainder left with the natural bark covering.

SEATS

The seats in Fig. 339, too, are simple to make. To make them thoroughly comfortable the seats should slope downwards from 2 to 3 in., and the backs should have a good rake. If naturally bent wood is used for the back uprights, this backward rake is easily obtained. Practically all the main joints can be of either the notched kind given at *D*, Fig. 335, or the hollowed-out kind at *E*.

The simplest way of setting about the work is to put together the front and back frames independently, and then join them with the side rails and arms. Use 2½-in. or 3-in. stuff for the main framework. The seat should be about 14 or 15 in. high at the front, and can be about 16 in. deep. When the members of the main frames have been put together, the diagonal struts can be added, and then the lighter crisscross parts nailed on. The last-

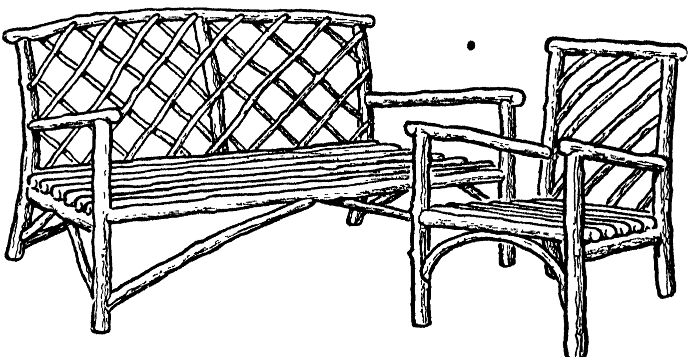


FIG. 339.—SIMPLE SEATS IN RUSTIC WORK.

named can be nailed directly over the rails, or for a better job they can be let in with joints of the kind shown at *C*, Fig. 335. Finally the seating is added. These could be 1½-in. or 2-in. pieces. In the case of the long seat a centre rail is necessary to give additional support. If desired, plain boards could be used instead of rustic pieces. In this case it is advisable to stain them down to the colour of the bark and finish with a coat of varnish.

GARDEN SCREEN AND ARCH

To separate one part of a garden fron another a rustic screen is very effective, and when covered with climbing plants looks delightful. Fig. 340 shows such a screen in

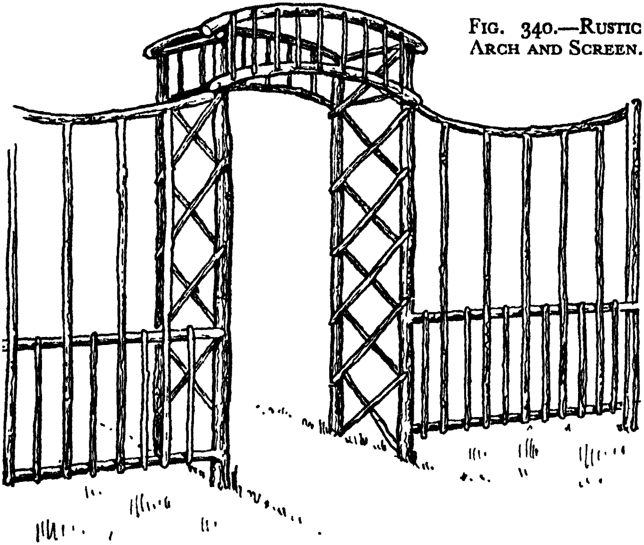


FIG. 340.—RUSTIC ARCH AND SCREEN.

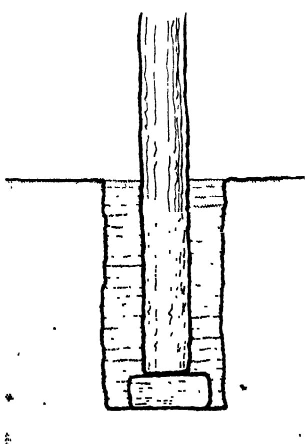


FIG. 341.—POLE SUNK IN EARTH WITH BRICK FOOTING.

which an arch is incorporated. The first step is to mark out the position of the screen, and a good way of doing this is to drive in a couple of stakes at the extremities. A piece of string held with nails driven into these gives a straight line upon which the measurements can be made.

The uprights should be sunk into the earth for a couple of feet, and the holes should first be dug

with a narrow spade. At the bottom of each hole a piece of broken brick or stone can be placed, as shown in Fig. 341, to give a good foundation. If working alone, a couple of diagonal struts can be nailed temporarily to the upright while the earth is being replaced. A stout pole can be used to ram it well down. A piece of string with a weight tied at the end and held at the top will give a good indication whether the pole is upright.

Proceed with all the uprights, and then add the various rails. When nailing, it is a good plan to hold a weight behind the work so that it is held firmly. The curved members at the top can be naturally bent branches. They are fixed with one of the notched joints shown in Fig. 335. One point to note is that it is advisable to make the rails horizontal, regardless of the angle at which the ground may happen to slope. Otherwise the result may appear lop-sided. After the main rails are fixed, the various lighter members can be added. Remember to creosote the ends of the uprights sunk into the ground.

RUSTIC PERGOLA

The work involved in this (Fig. 342) is somewhat similar to that of the screen. The first step is to mark out the site with pegs. Drive in the end ones first, and, in the case of a long pergola, add one or two between. These can be sighted by drawing the string taut. If it should be required to follow a crooked shape, each section can be regarded as complete in itself, pegs being driven in at the angles.

The uprights are sunk into the ground as before, being well rammed in and tested to see that they are vertical. They should all be cut off to the same length first, to save any awkward cutting later. This means that all the holes must be dug to the same depth. When in position, the

short rails joining each pair of uprights are fixed with either the joint *D* or *E* in Fig. 335.

To the tops the long rails are fixed, and it is necessary to join these with the spliced joint *A*, Fig. 335. It is a good plan to make these joints before fixing the rails, though they are nailed together when in position. If possible, the joints should be arranged above one of the uprights,

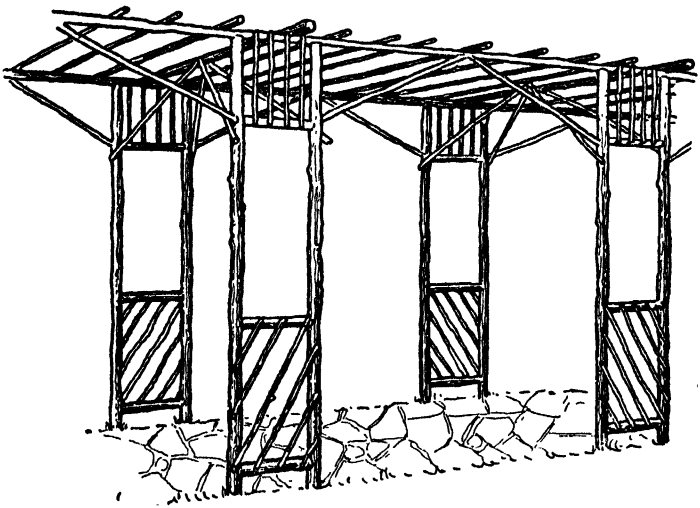


FIG. 342.—ATTRACTIVE PERGOLA.

so that they are supported. This may in a measure affect the spacing of the uprights, and should be taken into account when plotting out the pergola. The length of the available poles affects this mainly.

The various diagonal struts follow, these being notched in as at *C*, Fig. 335. Finally the top cross poles are added. A good plan is to fix one extra stout pole above each upright, so that the inner diagonals have something firm to which they can be fixed. The remainder need not be more than 1 in. or 1¼ in. thick.

SUMMER-HOUSE

This, Fig. 343, always looks well in rustic work. The size can be planned in accordance with the space available and the accommodation needed. The height should be

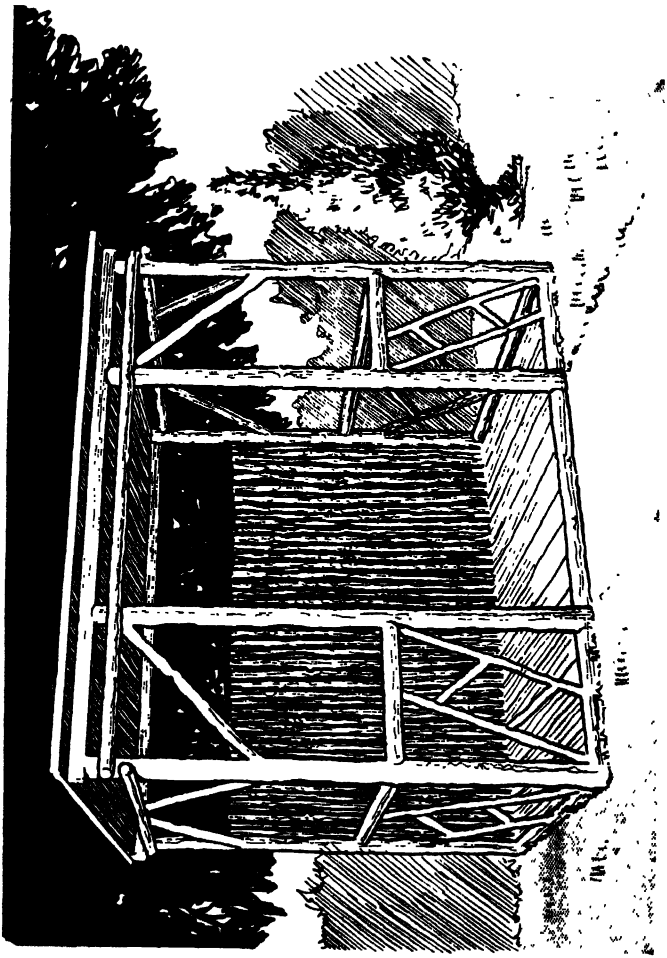


FIG. 343.—SUMMER-HOUSE WITH BOARDED ROOF.

sufficient to allow ample head room at the door—say, 6 ft. 6 in. For the roof ordinary tongued and grooved boards are used, these being covered with roofing felt to make it weather-proof.

The site having been decided upon, pegs should be driven in at the four corners and string tied between them to give an indication where the inner posts are to be

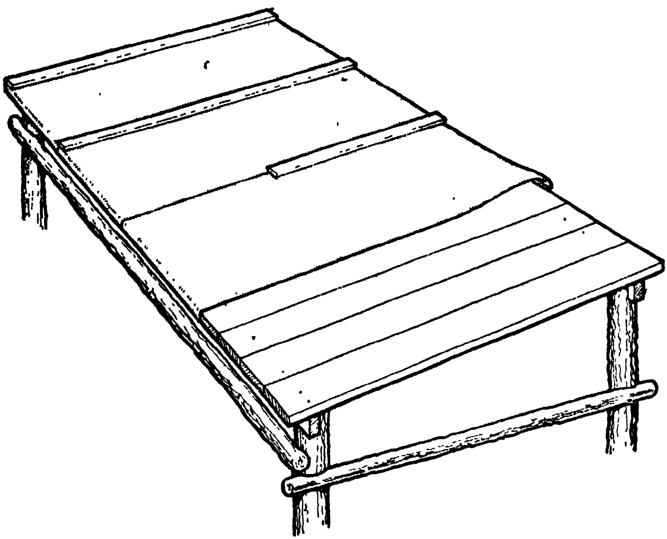


FIG. 344.—HOW FELT IS LAID ON ROOF OF SUMMER-HOUSE.

erected. With a spade dig in the six holes about 2 ft. deep, and, having creosoted the ends of the uprights, place them in position, ramming in the earth all round. They should stand upon broken pieces of brick as shown in Fig. 341. Remember that the uprights at the back are about 9 in. shorter than those in front, to allow rain to drain away from the roof.

If the site is not very level, it should be made up flat.

It is better to add earth rather than to dig away the high places, because there is then a natural drainage away from the house. Battens can be nailed all round to prevent the fresh earth from falling away.

The various rails are now added, these being notched in and secured with nails. The diagonal struts add greatly to the stability, and are notched in as at *C*, Fig. 335. As the roof consists of tongued and grooved boards running from front to back, it is necessary to fix prepared battens of about 3-in. by 1-in. stuff to both back and front uprights, so that the roof has flat surfaces to which it can be nailed. The battens can fit in notches somewhat similar to the joint at *G*, Fig. 335, except that only one notch is needed in each upright. It is an advantage to cut these notches before the uprights are erected.

Fig. 344 shows how the roofing-felt is fixed. It is laid in strips running from front to back, and the joints are covered with 1-in. by ½-in. battens nailed down on top. At the edges the felt should overlap and be nailed underneath. The back of the house consists of a number of thin strips nailed to cross-rails. The floor can either be left plain, or boarding can be nailed on to joists resting upon bricks. They should be well creosoted. Seating could be added if desired, though the more usual plan is to have deck chairs, which can be folded up when not required.

2. Formal Work

GARDEN SEAT

3 ft. 9 in. long. Or may be 4 ft.

Two points about a garden seat should always have attention. Keep the seat well below the height of an ordinary dining-room chair, so that the legs of the sitter are comfortably rested. In determining the height,

allow also for the likelihood of a cushion being used. Secondly, have an ample distance from front of seat to

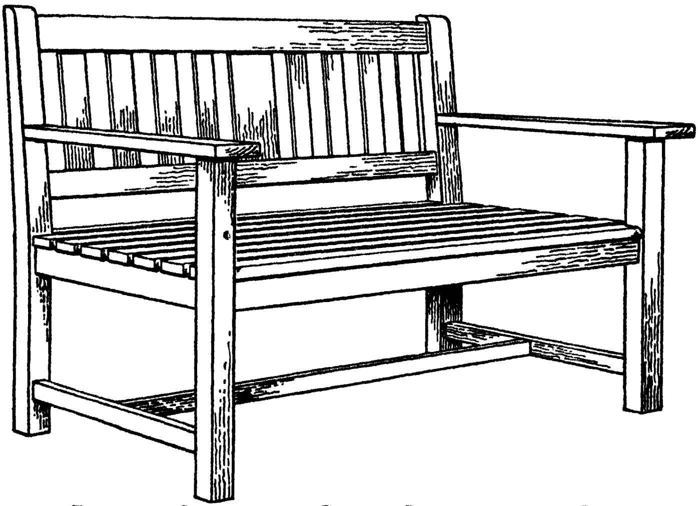


FIG. 345.—COMFORTABLE GARDEN SEAT, 3 FT. 9 IN. LONG. Could be in hardwood finished with varnish, or enamel could be used to finish it.

CUTTING LIST

	Length.	Width.	Thickness.
(*A*) 2 Front legs	2 ft. 2 in.	2 in.	2 in.
(*B*) 2 Back ,,	3 ,, ½ ,,	3 ,,	2 ,,
(*C*) 2 Seat rails	3 ,, 9 ,,	2½ ,,	1¼ ,,
(*D*) 3 ,, ,,	1 ,, 8 ,,	2½ ,,	1¼ ,,
(*E*) 2 Underframe rails	1 ,, 8 ,,	1½ ,,	1¼ ,,
(*F*) Stretcher rail	3 ,, 8 ,,	1½ ,,	1¼ ,,
(*G*) Back rail	3 ,, 9 ,,	3 ,,	1¼ ,,
(*H*) Lower back rail	3 ,, 9 ,,	2½ ,,	1¼ ,,
(*J*) 2 Arms	1 ,, 9 ,,	4 ,,	1 ,,
(*K*) 7 Seat laths	3 ,, 9 ,,	2 ,,	⅞ ,,
1 Front lath	3 ,, 9 ,,	2½ ,,	⅞ ,,
(*L*) 8 Back splats	11 in.	2 ,,	⅝ ,,
1 Middle splat	11 ,,	5 ,,	⅝ ,,

Lengths and widths allow for joints. Thicknesses given are intended to be net.

back, again assuming that a cushion is a common luxury. With a wide and fairly low seat it is not necessary to give much of a rake to the back legs.

In Fig. 346 the seat rails (*D*) are shown as perfectly horizontal—the most simple in construction. If pre-

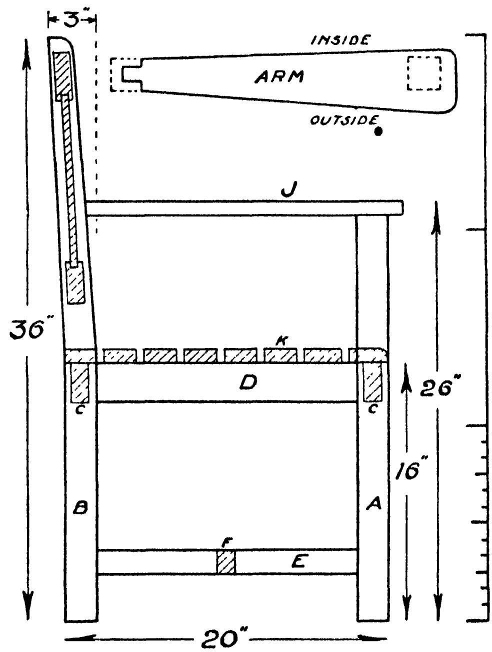


FIG. 346.—SECTIONAL END VIEW SHOWING RAKE OF BACK.

ferred they may be arranged to slope gently towards the back—say, a matter of ½ in. Alternatively, the top edges of the three seat rails (*D*) may be slightly curved (concave), so that, when the laths are fitted, the seat has a dip of about ½ in. in the centre.

For a seat up to 4 ft. long follow the widths and thicknesses given in the cutting list. For a length of 4 ft. 5 in.

or 5 ft. increase the stuff for legs to 2½ in. square, and use 3 in. by 1½ in. for the seat rails and 2 in. by 1½ in. for the underframing rails. This applies to hardwood. Note that in the construction glue is not used. All the joints are fitted with thick paint and secured with hardwood dowel pegs also painted in.

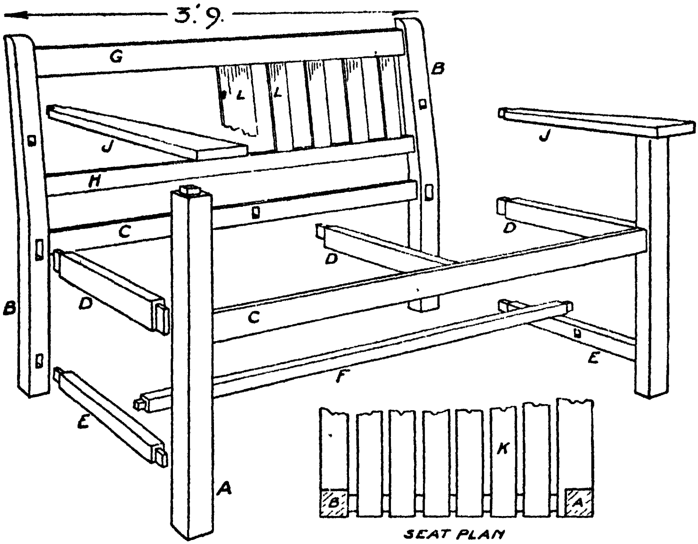


FIG. 347.—HOW THE SEAT IS ASSEMBLED.

First complete the two ends. The back legs (*B*) can be got out of boards 3 in. wide to allow for the rake. At the top they may be tapered slightly (not more than ¼ in.) as indicated at Fig. 346. The rails *D* and *E* are tenoned to the legs. The arm (*J*) enters the back leg by a tenon. To the front leg it should be wedge-pegged through the stub tenon shown in Fig. 347. Note the plan of arm in Fig. 346.

The upper back (Fig. 347) is next tackled. The rails

G and *H* are grooved $\frac{5}{8}$ in. wide and about $\frac{3}{8}$ in. deep throughout their length to take the splats (*L*), which, correctly spaced, are painted in. Short lengths of hardwood ($\frac{3}{8}$ in. by $\frac{5}{8}$ in.) are cut to fit the spaces left in the grooves between the splats, and also painted in. The seat may now be assembled, the two completed ends being connected by the seat rails (*C*, *C*), the back (*G*, *H*) and the stretcher rail (*F*) all tenoned in and well cramped. Do not overlook the intermediate cross rail (*D*), which is required as a central support for the seat laths (*K*). In screwing down these laths use brass screws, carefully countersinking for the heads and driving them well home. Also note that the laths overhang the rails at the ends, being kept flush in line with the legs.

GARDEN SCREENS AND TRELLIS

Garden woodwork decoration in the way of screens, arches, and trellis can only be suggested, as in few cases are individual requirements or tastes alike. Arches, as it happens, are rarely erected where an archway of any kind is appropriate. Most frequently they are a mere excuse for the growing of a rambler or the more homely climbing nasturtium. On the other hand, it is often desired to shut off a modest back yard or even back door from the garden, or to separate a vegetable portion from the flower-beds, and in such cases a screen is more quickly erected than a privet hedge may be grown. Simple trellis, again, may often brighten an otherwise tame piece of ground.

For a dividing screen Fig. 348 may be suggested for consideration, largely on account of its easy adaptability in the matter of length and height. Assuming that a gateway is required, the arch shown is very simple in erection and pleasing in line. The screen arrangement on

either side, with alternative square and diamond barring, is suitable either for climbing plants or for being left plain. The thickness of material used depends on the

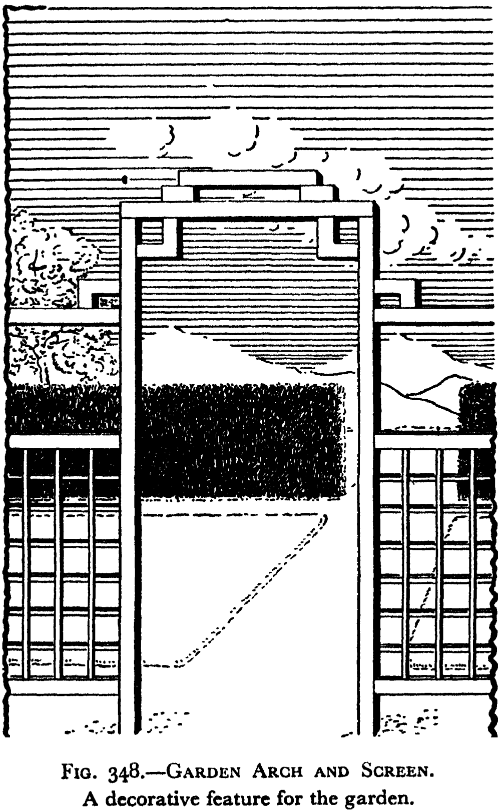


FIG. 348.—GARDEN ARCH AND SCREEN.
A decorative feature for the garden.

length and height of screen: partly, too, on whether a wall is available at either side for fixing. For one of the size of Fig. 349 the posts (*A*) should be not less than 3 in. by 3 in., or 3 in. by 2 in. with the 2-in. width showing on

face. In the case of smaller screens the posts should never be less than 2 in. by 2 in. For the intermediate posts (*B*) and the cross-rails (*C*) slightly lighter material may be used, but it is often more convenient to have all the framing of the same strength. The joints are usually by halving or notching (Fig. 352), the meeting parts being thoroughly smeared with thick paint, and the joints then held by hardwood pegs painted and driven through.

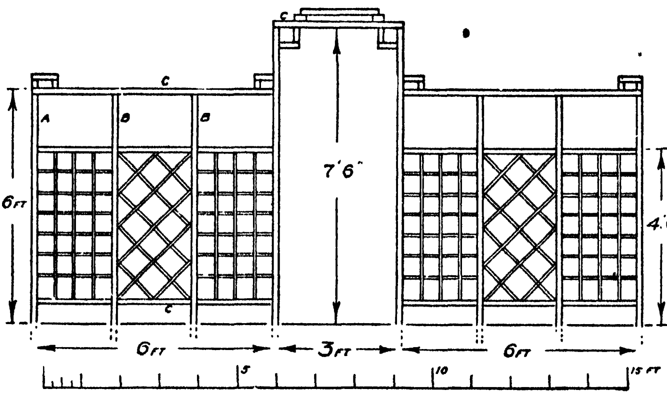


FIG. 349.—GARDEN SCREEN WITH ARCHED GATEWAY.

For bold trellis barring as in Fig. 350 the laths may be $1\frac{1}{4}$ in. by $\frac{1}{2}$ in., fixed to fillet scantling nailed to the posts. This applies to fairly wide openings of about 6 in., but if the spacing is closer, a smaller lath will be used. Ordinary trellis laths vary from $\frac{3}{4}$ in. by $\frac{1}{4}$ in. to 1 in. by $\frac{1}{2}$ in., and in every case the purpose for which it is required and its relation to the general design have to be taken into consideration. The laths can be fixed by means of fillets nailed to posts and iron rails, as in Fig. 353.

Fig. 350 is a type of screen which might partition off a vegetable plot from the flower-garden. For a short screen the minimum thickness for post is 2 in. by 2 in., and when

the length exceeds 10 ft. it is wise to have 3 in. by 3 in. for rigidity. The type of barring shown here is similar to that at Fig. 349, stout laths being used.

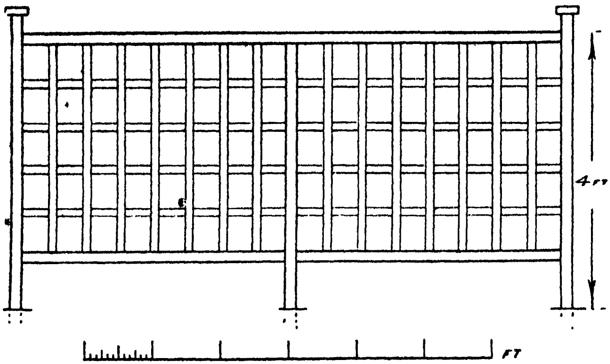


FIG. 350.—SIMPLE DIVIDING SCREEN FOR GARDEN.

Fig. 351, again, is the ordinary type of garden trellised paling, a convenient height for which is about 5 ft. The posts here may be increased to 4 in. square, especially for

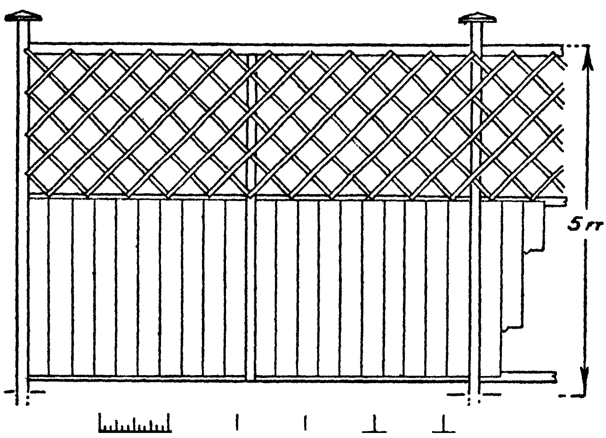


FIG. 351.—GARDEN TRELLISED PALING.

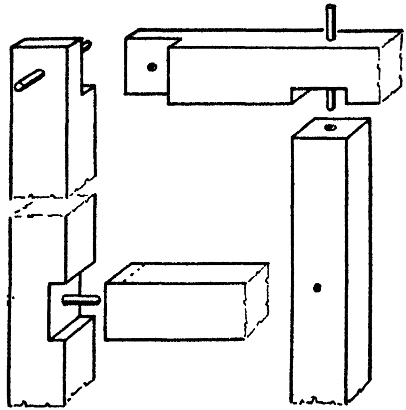


FIG. 352.—HALVING AND NOTCHING FOR SCREEN FRAMING.

lengths of paling running to 25 ft. or more. The lower part may be boarded up with cleft slats, overlapping; or, more formally, with 4-in. tongued and grooved match-

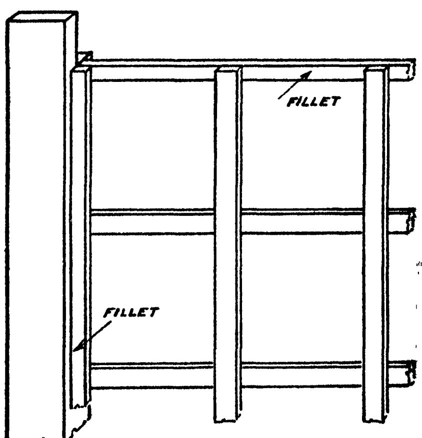


FIG. 353.—METHOD OF FIXED BARRING.

boarding. Light laths not exceeding $\frac{7}{8}$ in. by $\frac{3}{8}$ in. will serve for the upper trellis.

When arches are erected without accompanying screens, allow a head clearance of not less than 7 ft. for a width of from 3 ft. to 3 ft. 6 in. An isolated arch seems dwarfed if kept lower, and is apt to be an inconvenience when drooping creepers hang from it. For an arch which is a mere gateway, the clearance need not exceed 6 ft. 6 in., although (as in Fig. 349) it is usual to raise it when there is a fairly high screen.

All posts should be cut so that they may enter the ground from 12 in. to 18 in. as necessary, the lower portions being well tarred. The thorough painting of joints (leaving no part of the wood bare) is the best protection against deterioration. After the preliminary priming of red lead, all the woodwork should have two coats of paint, with a fresh coat every two years.

DOG KENNEL

Size 2 ft. 9 in. by 2 ft. Height to Apex 2 ft. 6 in.

No definite standard size can be laid down for a dog kennel, the dimensions necessarily depending on the breed of dog to be housed. From a design such as that shown, however, the reader can adapt the sizes to his own requirements. Two slight modifications may be desired by some: (1) the opening may be preferred at the side, and (2) a steeper pitch for the roof may be desirable. In either case the modification is easily carried out.

The sides of the kennel are frames, afterwards boarded, and later bolted together. The corners are so fitted that they are practically draught-proof. The floorboards, raised 3 in. from the ground, rest on the side frames. The roof is nailed down and will, as usual, be protected by roofing-felt. For cleaning purposes one complete side

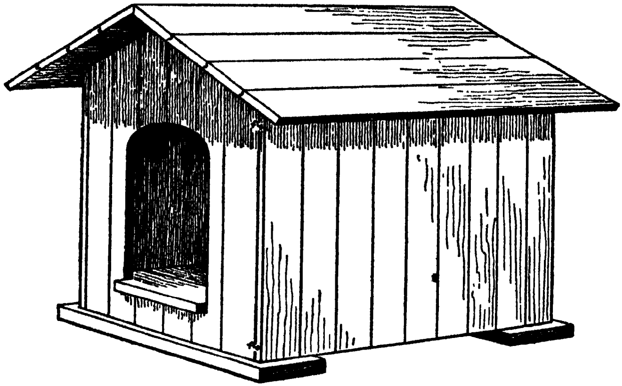


FIG. 354.—KENNEL.
Size 2 ft. 9 in. by 2 ft. Height 2 ft. 6 in.

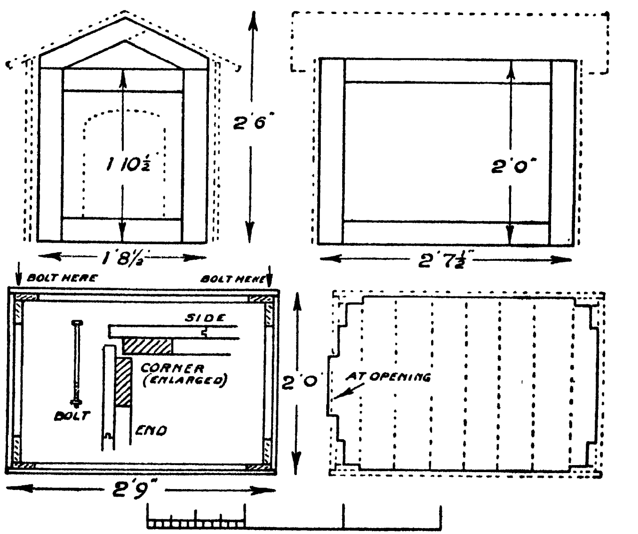


FIG. 355.—SCALE ELEVATIONS AND PLAN.

can be fitted so as to be removable; instead of being bolted, it can be held by two stout hooks and eyes at each end (see *X*, Fig. 357). To facilitate its easy removal, one side of the roof may be hinged to lift. In this case the hinged side will be secured by a hasp when closed.

SIDE FRAMES

The two side and two end frames (Fig. 355) can be put together from deal 3 in. by 1 in. or (in the case of a smaller kennel) $2\frac{1}{2}$ in. by $\frac{7}{8}$ in. The corners may be bridle-jointed or half-lapped, as preferred. The end frames have apex pieces added to carry the roof (see Fig. 356), the two short lengths used for these being half-lapped to meet.

The tongued and grooved boarding should, for a warm house, be at least $\frac{3}{4}$ in. thick; $\frac{7}{8}$ in. is used for large kennels and $\frac{5}{8}$ in. for smaller ones. The width of boarding is immaterial, but 4 in. is, on the whole, preferable to 6 in. Note particularly from Fig. 355 (plan) how the end frames come *within* the longer side frames; also how in each case the boarding overlaps the framing so that draught is excluded.

THE FLOORBOARDS (FIG. 356)

These are cut to length and trimmed at the back and front ends to rest on the ledge of the lower framing-rails and butt close up to the boarding. Where the boarding engages the opening, it should overhang about an inch. Floorboard of at least $\frac{7}{8}$ in., tongued and grooved, should be used.

THE ROOF (FIG. 357)

This overhangs 3 in. at each end, and about the same at the sides. It again is of $\frac{3}{4}$-in. tongued and grooved matchboarding held together with 3-in. wide battens

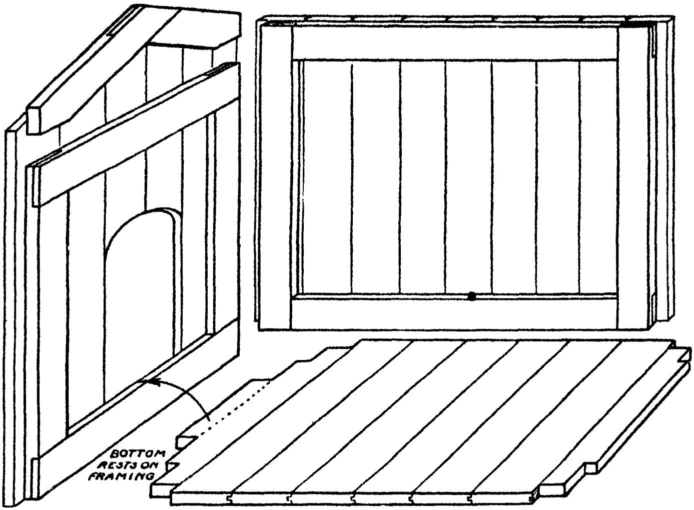


FIG. 356.—END AND SIDE FRAMES WITH FLOOR READY FOR BOLTING.

which may be arranged to come just within the carcase framing. Care should be taken to allow for the bevelling of the kennel sides, so that the roof fits close. Ventilation as required can be provided by boring holes in sides or

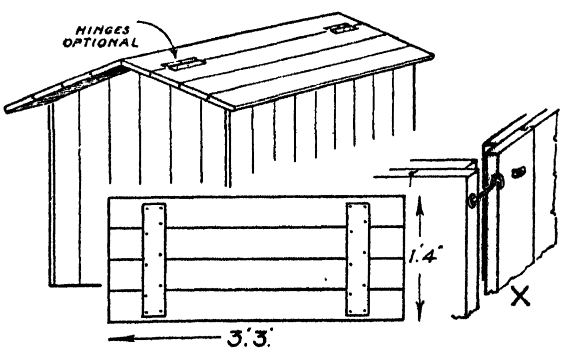


FIG. 357.—ROOF AND (X) MOVABLE SIDE.

ends a couple of inches below the roof. Unless the kennel is under cover from rain, waterproof roofing-felt is necessary for its protection.

POLE PIGEON COTE

When pigeons are to be kept, by far the most satisfactory cote is one of the pole type. It can always be an attractive feature in the garden; the birds are secure from prowling cats; and the cote is much more readily accessible than if placed on a brick wall.

The cote shown in Fig. 358 may be varied in size according to requirements. It will house few birds, but, by slightly increasing the height, a second storey may be added. The height from ground to platform should not be less than 7 ft., and may easily be more if the pole is well sunk for rigidity.

THE COTE

Turning to Fig. 359, a start will be made with the cote, the platform (*A*) for which may be 2 ft. 6 in. square. It can be made up of tongued and grooved boards, ¾ in. or ⅞ in. thick, with two battens (3 in. by ⅞ in.) nailed underneath, flush with the ends. As the platform is seen from below, nail similar battens on the other two sides. From the plan of the platform (Fig. 360) it will be seen that the house is 1 ft. 9 in. square. Its height is 1 ft. 3 in., and for good effect it tapers at the top to 1 ft. 6 in. square. The sides (*B*) are built up with ⅝-in. or ¾-in. tongued and grooved board, 1½-in. wide battens being nailed on top and bottom (inside) as in Fig. 361. The entry holes may be 6 in. by 4 in., or 6½ in. by 4½ in.

The plan (Fig. 360) shows how the interior is schemed in the most comfortable way. The partition pieces (*C*) are halved when they intersect, being placed at the angle

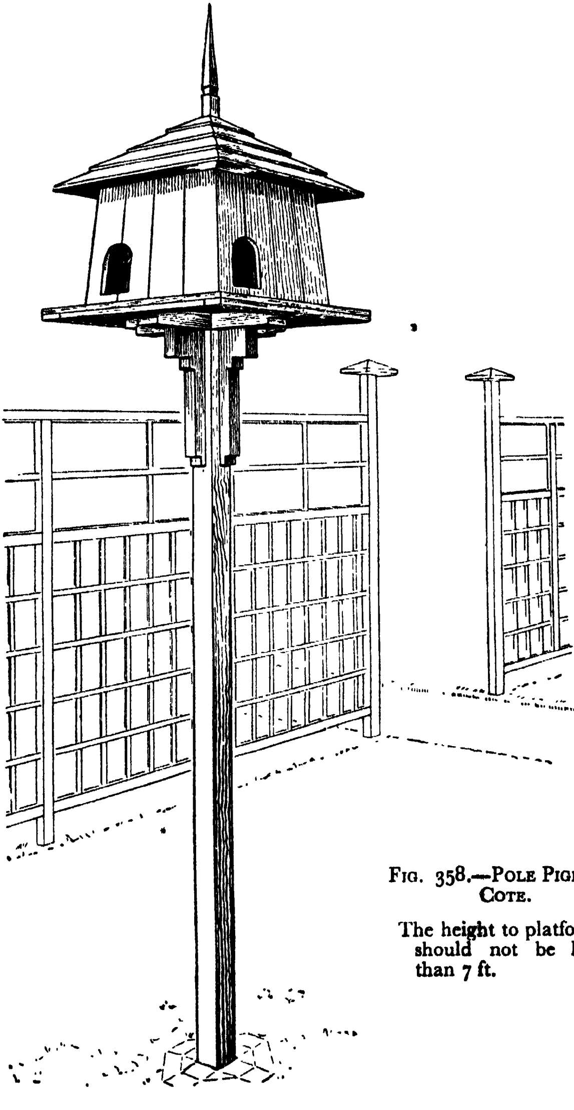


FIG. 358.—POLE PIGEON COTE.

The height to platform should not be less than 7 ft.

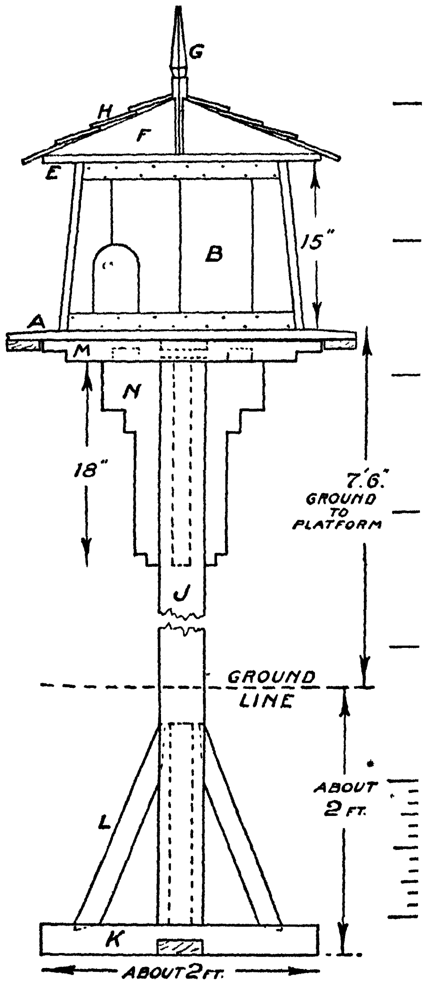


FIG. 359.—SCALE DETAILS OF COTE.

shown. They may be of $\frac{3}{8}$-in. or $\frac{1}{2}$-in. plywood, nailed to fillets (*D*) which will be bevelled for the purpose.

The roof board (*E*, Figs. 359 and 361) may be 2 ft. square, boarded up from 3-in. stuff, and held together with three battens. The edges of this roof (which is nailed down on the house) should be bevelled as indicated to take the weather-boarding. To give a neat finish, a finial (*G*, from 15 in. to 18 in. long) is cut from $1\frac{1}{2}$-in. square stuff and tapered to a point as shown. Against this the roof supports (*F*), lying

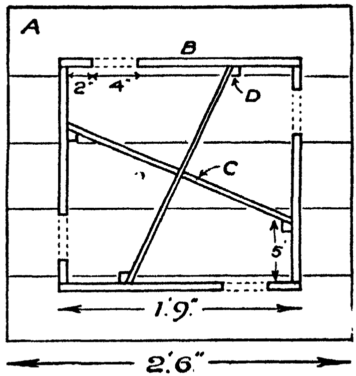


FIG. 360.—PLAN OF COTE AND PLATFORM.

CUTTING LIST

For a pole-cote of the size shown the quantities required will be these:—

	Length.	Width.	Thickness.
(*A*) For platform . .	13 ft.	6 in.	$\frac{3}{4}$ in.
For 4 battens . .	10 „	3 „	$\frac{3}{4}$ „
(*B*) For cote sides .	21 „	6 „	$\frac{5}{8}$ „
For 8 battens . .	13 „	$1\frac{1}{2}$ „	$\frac{3}{4}$ „
(*C*) For 2 partitions .	4 „	15 „	$\frac{3}{8}$-in. ply
(*D*) For 4 fillets . .	5 „	1 „	1 in.
(*E*) For roof . .	8 ft. 6 in.	6 „	$\frac{5}{8}$ „
(*F*) For supports . .	6 ft.	6 „	$\frac{5}{8}$ „
(*G*) Finial . . .	1 ft. 3 in.	$1\frac{1}{2}$ „	$1\frac{1}{2}$ „
(*H*) For roof, weather boards . .	26 ft.	4 „	$\frac{1}{2}$ „
(*J*) Pole . . .	9 ft. 6 in.	4 „	4 „
(*K*) 2 Pieces, each .	2 ft.	4 „	$2\frac{1}{2}$
(*L*) 4 Braces, „ . .	1 ft. 9 in.	4 „	$1\frac{1}{2}$ „
(*M*) 2 Cross-bars, each .	2 ft.	4 „	2 „
(*N*) 4 Brackets, each .	1 ft. 6 in.	5 „	$1\frac{1}{2}$ „

Allowances have been made for cutting and trimming, but all thicknesses are intended to be net.

diagonally across the roof board (*E*), are nailed. When these are fixed, a cardboard template of the shape of the roof may be made and the weather-boards (*H*) cut and nailed down. Allow the front boards to overhang a matter of 2 in., and cover the corner joints with strips of

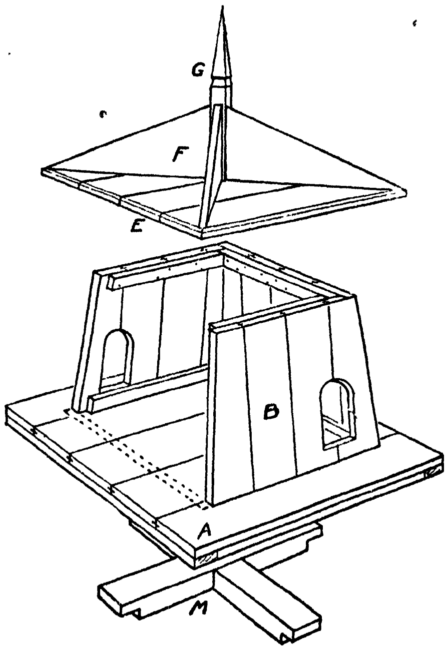


FIG. 361.—CONSTRUCTION OF COTE.

protective roofing-felt. If the projecting part of the platform (*A*) is planed down a trifle towards the edges, this will help to drain off the wet (see *A*, Fig. 359).

THE POLE

Remember that, as even a small cote of this size offers a certain resistance to the wind, the pole (*J*) and its

fixings must be strong. For the pole, choose a sound 4-in. square length. If trouble is not grudged, it may taper (from ground level) to 3 in. at the top. For sinking into the ground, the method shown at Fig. 359 will secure rigidity. The bottom boards (*K*), halved where they cross, may be 4 in. by 2½ in., and the braces (*L*) 4 in. by 1½ in. The part to go underground will be well tarred.

The top cross bars (*M*), 4 in. wide by 2 in. thick, are also halved where they intersect. The brackets (*N*), 15 in. to 18 in. long, should be cut from 1½-in. stuff. These may be tenoned to the cross bars and screwed to the pole. The platform is firmly screwed to the cross bars.

SUMMER-HOUSE

Size 8 ft. by 5 ft.

The features of this small summer-house, or garden shelter (Fig. 362), may be emphasised. One is the angled corners, which give character as well as lightness to the structure; the other is the sloping roof, which, it will be noticed, overhangs the canted corners and permits, if desired, of flower-baskets being hung from the meeting-point of the beams. The whole may be built in sections bolted together if removal at a later date is likely. The floor is raised about 6 in. from the ground, so that the house may stand on a ground-work of cement or on brick piers.

THE FRAMEWORK

For the general framework 2-in. by 2-in. stuff will serve if the timber is sound. For the best work it is wise to mortise and tenon the joints, the tenons being painted in when assembling. Otherwise, half-lapped joints may be employed, again painting them to guard against

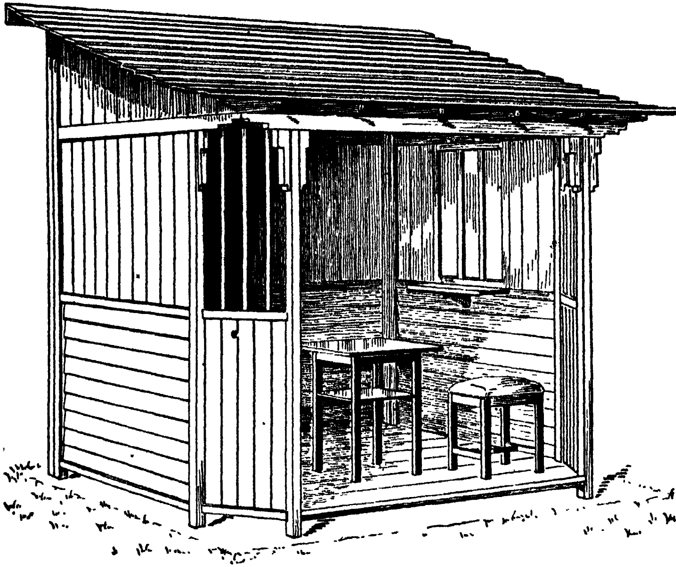


FIG. 362.—LIGHT SUMMER-HOUSE. Size 8 ft. by 5 ft.
The canted corners and sloping roof are attractive features.

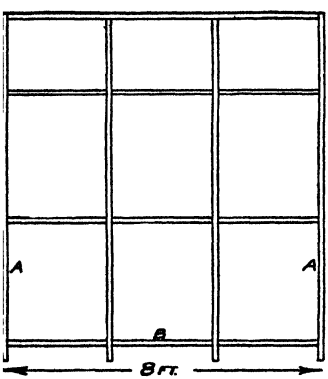


FIG. 363.—BACK FRAMING.

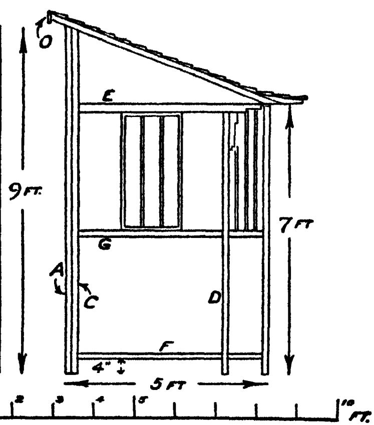


FIG. 364.—END FRAMING.

decay and (preferably) fixed with hardwood pegs painted when driven home.

The back frame (Fig. 363) is 8 ft. wide by 9 ft. high, and calls for no comment. Note, however, the height of the bottom rail (*B*) from the ground, as, on account of the flooring, the corresponding rails at ends and front must be the same height. The same caution applies to the intermediate sill rails.

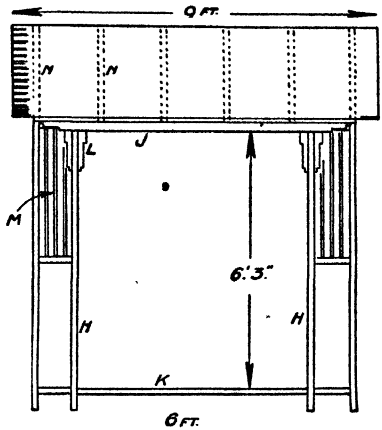


FIG. 365.—FRONT FRAME.

In Fig. 364 the elevation of end frame shows the corner extension part and also the roof; but the frame proper consists of the back and front uprights (*C* and *D*), the beam (*E*) and the rails (*F* and *G*). The cross beam (*E*), to which the post (*D*) should be tenoned, will be 3 in. or more wide to correspond with the front beam (*J*). The completed frame will be bolted through post (*C*) to the main post (*A*) of the back frame.

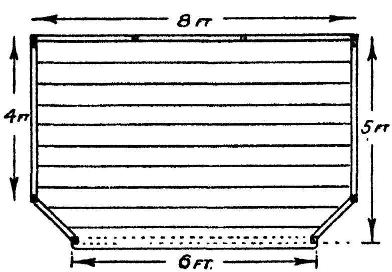


FIG. 366.—PLAN AT FLOOR.

The front frame (Fig. 365) is made up of the two posts (*H*), the top beam (*J*) and the bottom rail (*K*). The posts are tenoned to the beam. Note that, whilst the width over the front (excluding the canted wings) is

6 ft., the beam (*J*) extends the full width of the house, having a projection of 1 ft. at each end (see details at Fig. 368). If felt desirable, the beams (*E* and *J*) may be of 4-in. by 2-in. stuff instead of only 3 in. by 2 in. In the same way, if thought necessary, the bottom rails (*B* and *K*) and

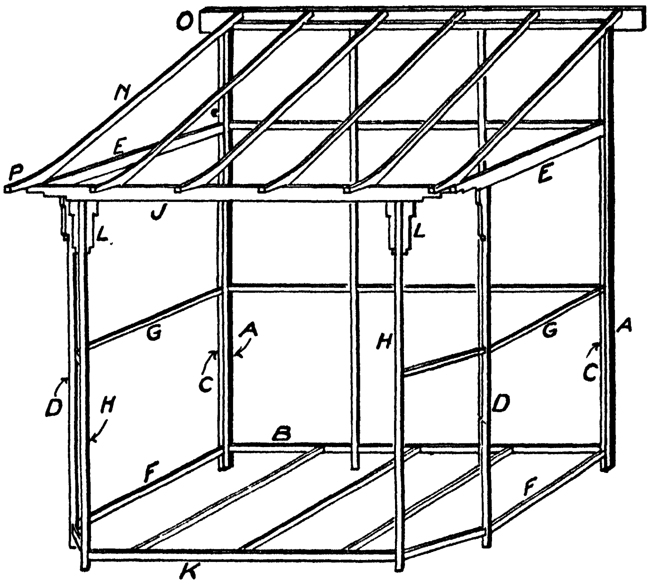


FIG. 367.—GENERAL VIEW OF SKELETON FRAMEWORK.

the floor joists might be 3 in. by 2 in. The meeting-beams (*E* and *J*) will be half-lapped together and bolted. The bolt, at its under end, may have a ring or hook from which a flower-basket could be hung.

The three short connecting rails between the front corner posts (*D* and *H*) may be notched into position and nailed. The bars of the upper filling (*M*, Fig. 365) can be $1\frac{1}{8}$ in. square, let into the rails.

FLOORING AND ROOF

The 1-in. tongued and grooved floorboards will rest on the bottom rails and be cut to fit around the posts. Three joists (see Fig. 367) will give additional support. As indicated in the plan (Fig. 366), the front floorboard should overhang the bottom rail (*K*) by about an inch, the edge being rounded over.

Six rafters (*N*) are suggested to carry the roof boarding. At the back these will project about 6 in., with a 5-in. or 6-in. fascia board behind. The rafters will require a

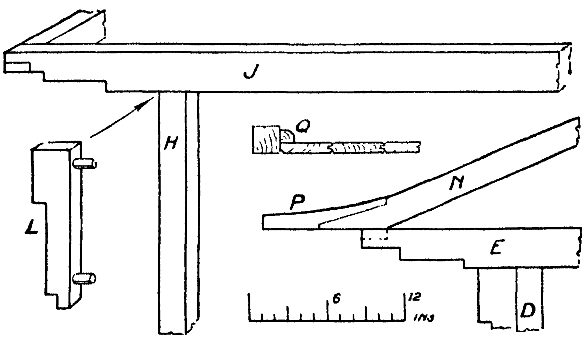


FIG. 368.—FRONT BEAM, BRACKET, RAFTER, ETC.

length of about 6 ft. 3 in., but this must be determined on the spot. At the back they are notched to the top back rail, whilst at the front sprocket pieces (*P*, Fig. 368) are scribed and screwed to give the curve shown. The rafters, it will be observed, extend about 8 in. beyond the end of the projecting beam side (*E*), thus giving the roof an adequate overhang at front. For a house of this size 2-in. by 2-in. rafters will serve, but if preferred 3-in. by 2-in. may be taken. The feather-edged weather roof boards should overhang the rafters at each end by 6 in. They will then be 9 ft. long (see Fig. 365).

BOARDING

The boarding-in of the house may be carried out as suggested in Fig. 362, or otherwise, as desired. A good effect is obtained by weather-boarding the lower halves of back and ends, using tongued and grooved matchboard-

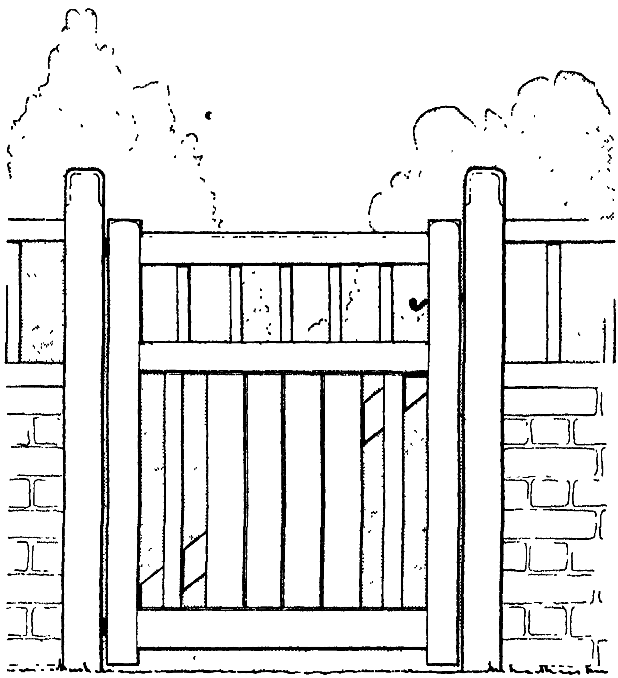


FIG. 369.—GARDEN GATE, 3 FT. WIDE, TO BE FINISHED WITH PAINT.

ing for the upper parts. The boarding may be nailed on fillets screwed to the posts and rails as at *Q*, Fig. 368.

The ornamental brackets (*L*), two on each front post (*H*) and one on the front face of each post (*D*), may be anything from 12 in. to 18 in. in length, and from $1\frac{1}{2}$-in.

stuff. They can be fixed with ⅜-in. dowel pegs painted in. If a window is required at either or both ends a separate frame is made and fitted between the beam (*E*) and rail (*G*, Fig. 365). It is not necessary to have a window to open.

The length of stuff required for framing posts, rails, etc., may easily be measured from the scale diagrams.

GARDEN GATES

Many people lost their garden gates during the war, and replacement is necessary. Two designs are given

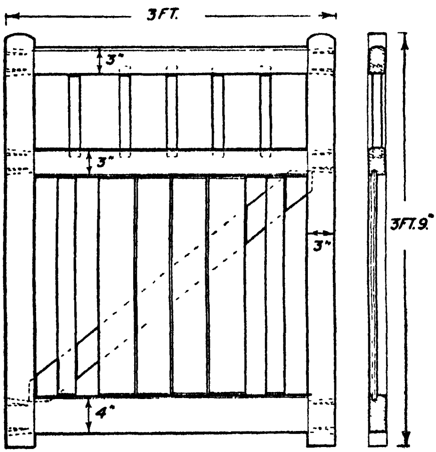


FIG. 370.—ELEVATION OF PAINTED GATE WITH MAIN SIZES.

here, one (Fig. 369) is intended to be painted, and the other (Fig. 372) is in natural oak with linseed oil rubbed in as a preservative. As an alternative it could be varnished. The width, 3 ft., could be varied within a little if necessary.

Taking first the gate in Fig. 369, the main uprights are of 3-in. by 2-in. stuff. The rails are all 2 in. thick, the top and middle one 3 in. wide, and the bottom one 4 in. wide. Fix together the uprights temporarily with a cramp and

mark out the positions of the rail mortises. All the tenons are set down at the top only, and this must be allowed for in the marking. The mortises run right through, and the tenons are wedged outside. This means that the marks must be squared round, and extra lines about ¼ in.

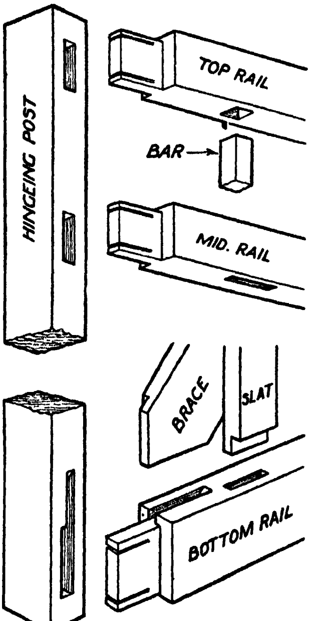


FIG. 371.—CONSTRUCTION OF GATE ON FIG. 369.

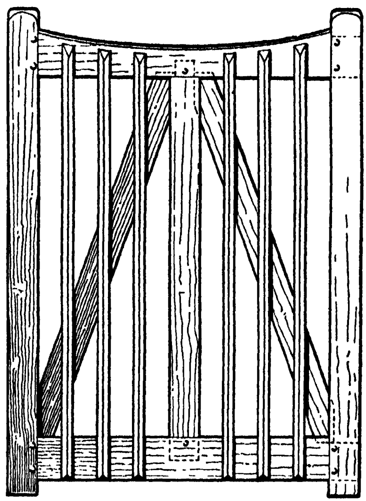


FIG. 372.—OAK GATE, 3 FT. WIDE.

at the outside squared across to allow the tenons to splay out when wedges are driven in. Bore holes with a bit slightly smaller than the mortise width in the mortises halfway through from each side. This removes a lot of the waste and eases the chopping with the chisel.

The rails, too, should be fixed together to enable the shoulder length to be squared across. Use a chisel

and square for the purpose. The mortises for the top bar positions should be squared in with pencil and square. These bars are 1 in. square and have no shoulders. This means that the mortises must be 1 in. square. They must be neatly cut, because any inaccuracy will be visible. Fix together the top and middle rails whilst marking. For the slats the middle and bottom rails must be placed together. The slats and brace at the inside can both be 1 in. thick, or the slats can be $\frac{7}{8}$ in. and the brace $1\frac{1}{8}$ in. It is necessary to decide this straightway, because it affects the mortise positions. This is made clear in Fig. 370. Note that the slats have bare-faced tenons. The brace slots can also be marked out. The marking will be simplified if the corner is drawn out full size. Note that the top and middle rails are chamfered at the top side.

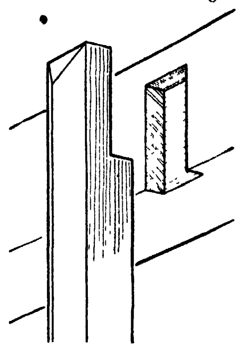


FIG. 373.—HOW BEVELLED UPRIGHTS OF OAK GATE ARE FIXED.

Use paint when assembling the gate, and give a coat of paint on both slats and brace. In this way, since the slats and brace touch each other, they will be sealed together. Fit all the bars between the rails, put in the slats and brace, and add the main posts. Cramp up and drive in the wedges. When set, level the joints and either round over the corners of the posts at the top, as in Fig. 369, or round them over entirely as in Fig. 370. Finish well with three coats of paint, remembering the end grain at the bottom of the posts. It is the end grain that is most easily attacked by moisture. When hingeing use long strap hinges, screwing these to the rails so that the main weight is taken from the hingeing post.

The oak gate is of similar construction, but the tenons

are pegged. All the main parts are of 2-in. stuff. Posts and mid upright are 3 in. wide. The top rail is 5 in. wide thinned down to 3 in. at the middle. Bend a lath to obtain a sweeping curve. Bottom rail is 4 in. wide. Note that the braces are 1¼ in. thick and are flush at the inside. Barefaced tongues are used (see dotted lines in Fig. 372). Fig. 373 shows how the bevelled uprights are secured to the rails. They are 1¼ in. thick, and they are cut away at the ends to fit into notches. At the top they finish 1 in. below the curve, so that the length will vary.

When assembling fit the middle upright to the rails, add the braces, and put on the side posts. Knock in the pegs and fit the bevelled uprights. They should be nailed with galvanised nails.

GARDEN GATES FOR CAR

Fig. 374 shows an attractive design suitable for the front of a house having a weather-boarded fencing. The lower part of the gates is also boarded, the advantage of this being that it keeps out dogs. Oak is the most suitable wood to use, and the sizes given can be increased somewhat if heavier material is available. The main posts especially should be as stout as possible, as they have to withstand both considerable wear and support considerable weight. The elevation in Fig. 375 gives a size of 9 ft. for the two gates, but this of course could be increased or diminished a little to suit special openings.

Take special care with the main posts. Sink them into the earth a considerable depth, and place a stone or brick at the bottom of the hole, afterwards well ram the earth on all four sides. If you can arrange to have a foot and strut, so much the better, as it will certainly help to prevent the post from leaning over. One of the main

secrets is in well ramming down the earth little by little as you proceed. The bottom of the post should be well treated with creosote or some other suitable preservative.

A rather better method is to ram rubble or hard core well down all round and then fill with cement in a proportion of three parts sand to one of cement. This can

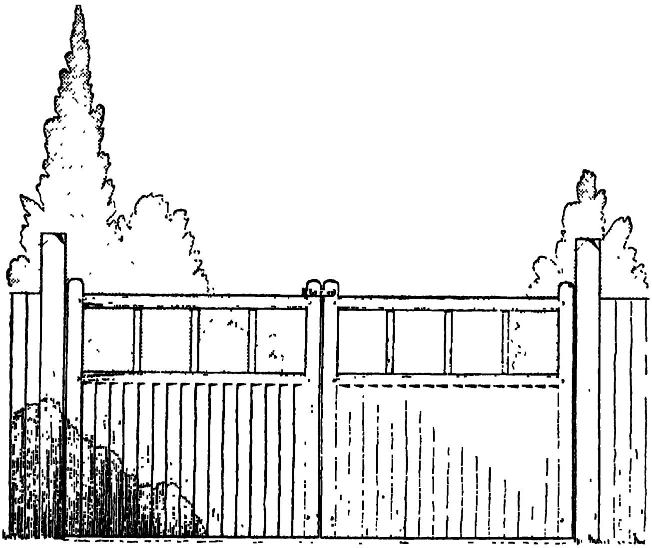


Fig. 374.—Garden Gates for the Car. Posts are 9 ft. Apart, but this could be Adapted.

be built up a little above the surface of the ground, so helping to keep water away from the timber.

Note from the illustrations that the two upper rails of the gates are 2½ in. thick, whereas the bottom rail is 1½ in. thick only. This allows for 1-in. weather boarding. Thus the bottom rail to which the weather boarding is directly nailed fits with barefaced tenons. The braces also are 1½ in. thick only, so that they line up both with

the bottom rail and with the rebate in the middle rail. They are notched into the angle between the stile and rail.

The marking out of all four stiles is the same, so that they can be cramped temporarily together and the marks squared across all four. For gates of this kind it is best to have through tenons and to peg them after assembling. Fig. 376 shows how the mortises are planed to be level with

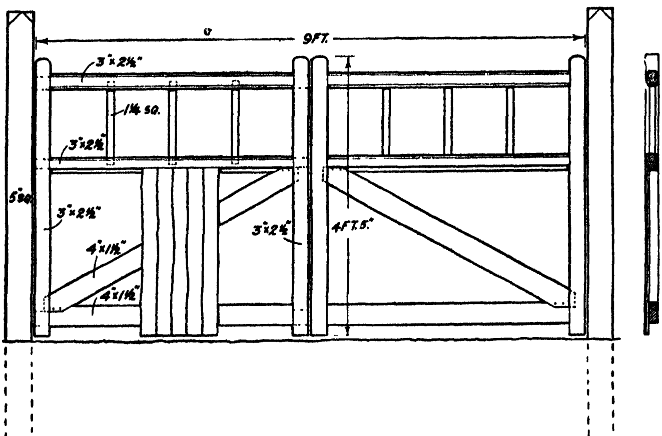


FIG. 375.—SCALE ELEVATIONS WITH MAIN SIZES.

the rebate. Remember to set in the mortises where necessary. Square in first the over-all rail widths and plan the set-in afterwards. At the top rail set-in need be no more than ¼ in. at the top. The same thing applies to the top of the middle rail, but underneath it lines up with the rebate, which might be ⅞ in. wide. The bottom rail also has a set-in at the top ⅞ or 1 in. The notches for the braces are best cut afterwards, though the width can be marked in with the mortise gauge at this stage, since they line up with the mortises.

The rails also can be fixed together temporarily whilst the shoulder lengths are being marked in. The tenons for the short stiles between middle and top rails can also

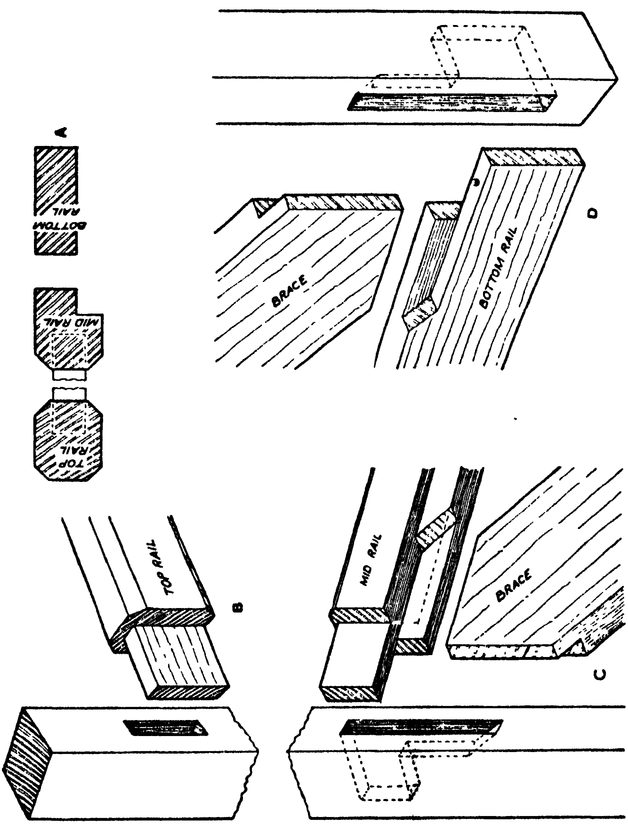


FIG. 376.
A. Sections through rails. *B.* Top rail joint.
C. Mid-rail joint. *D.* Bottom rail joint.

be marked. There is no need for shoulder if care is taken to cut the mortises exactly the size.

Having cut the joints, work the rebate along the middle rails (see Fig. 376). The chamfers, too, can be worked.

Now fit each gate together independently, marking the relative parts of each point so that they can be replaced. Cramp the whole together and prepare the braces. Lay these in position, thus enabling the shoulders to be marked in. The length of the notches to take them can also be marked. Separate the parts and cut these joints, and once again try the whole thing together. Remember that the braces are not ornamental; they have a definite supporting job to do, and the joints must therefore be accurate.

Put the whole thing together with either paint or a waterproof glue. Peg the joints and nail on the weather boarding. Use long strap hinges for hanging. They should be fitted level with the rails so that the strain is removed from the hingeing stiles. Bolt them at the back and fit the pins to the back of the main posts at the centre, thus giving full clearance when the gates are opened.

LYCH GATE

This makes an imposing front entrance for a fairly big garden. It would probably be rather too elaborate for a small garden, but, provided it is set well away from the house, it would look well. Oak is the ideal timber to use, but a softwood could be substituted providing it is kept covered with a preservative. This is specially important for the lower parts, which are buried. In any case, rebated oak weather boards are desirable for the roof.

As shown in Fig. 378, it is contained between a solid fencing, and a certain amount of lateral stability is obtained in this way. The same thing would apply to a brick wall, but, failing either of these, it would be advisable to introduce diagonal side struts at the bottom, these being tenoned into cross-pieces.

The whole is built up of three main portions, con-

sisting of two end frames joined by the roofing members. These two end frames are each made up complete in themselves, erected in position, and the roof parts built on to them.

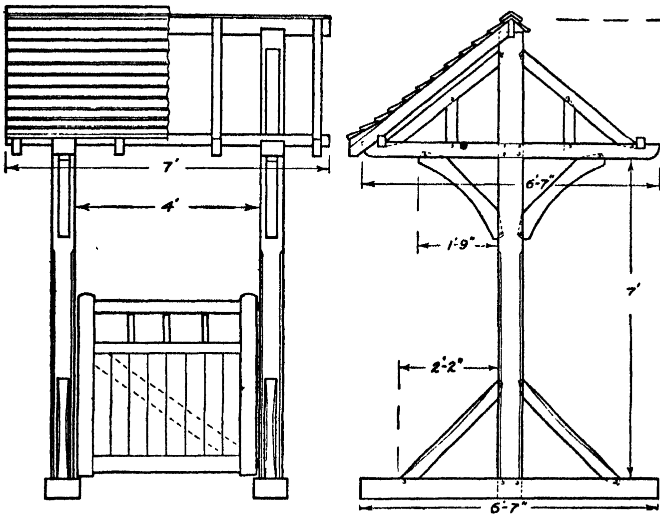


FIG. 377.—FRONT AND SIDE ELEVATIONS OF LYCH GATE. Clearance space between the main posts is 4 ft.

Both end frames would be made simultaneously in practice, but we deal here with one of them for clearness. Prepare the main post first to finish 6 in. square, allowing for tenons at both ends. Note that it does not pass right up to the roof apex, but stops short at the main cross bar into which it is double-tenoned. The surfaces could be left from the saw, or preferably finished with plane or adze. Saw the tenons, noting that, whereas that at the bottom passes right through (Fig. 377), at the top are double tenons which go only half-way through (Fig. 379).

At the sides sloping notches are needed to hold the sloping struts. These are shown in Fig. 379.

The bottom cross member is 8 in. by 5 in. or so, whilst the upper one is 6 in. by 4 in. The mortises should be marked out, including those for the short uprights at the top; also the sloping notches for the struts. The continuation of the main post at the top is fitted with a single

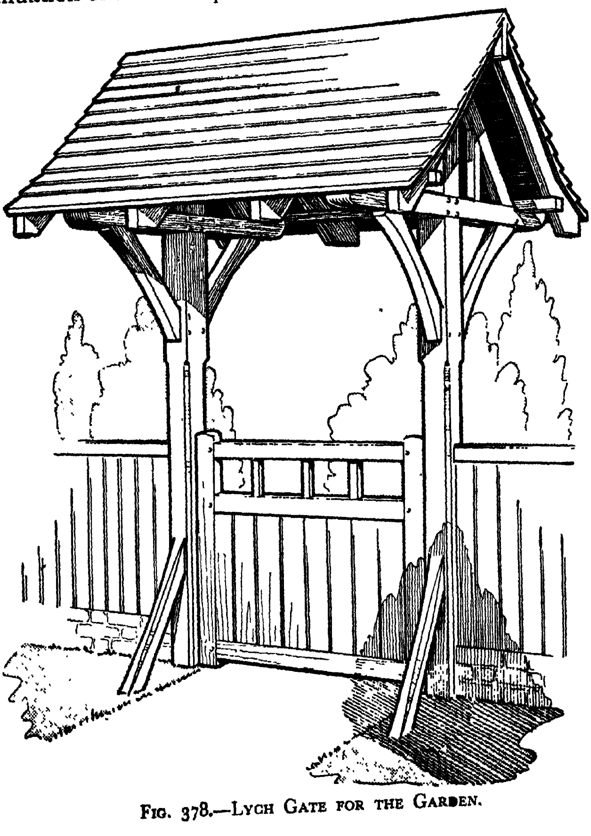


Fig. 378.—Lych Gate for the Garden.

tenon to the cross-piece. Its upper end is notched to receive the ridge (see Fig. 379).

All joints being cut and fitted, the corners should be chamfered where noted. The frames can then be assembled on the ground. Fit the cross-pieces to the main post, adding the struts during the process. Bore holes right through the joints and drive in dowels.

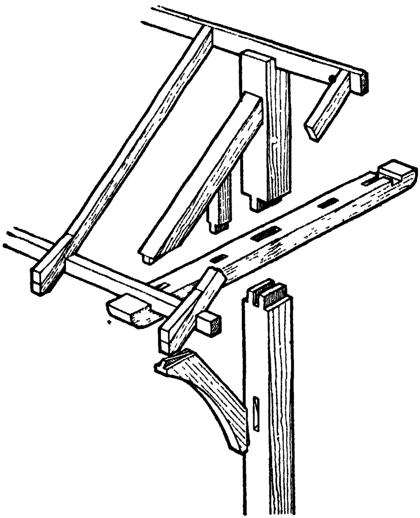


FIG. 379.—CONSTRUCTION OF ROOF PORTION OF LYCH GATES.

Insert the upper posts and insert the sloping members. The position of the mortises on the last named can then be marked placing a square on the cross-piece. The whole thing can then be put together. Notches to hold the pieces at the eaves parallel with the ridge are cut in the cross-pieces immediately outside the notches holding the sloping members.

At this stage the frames can be erected in position on the ground. Temporary struts can be nailed across the

main uprights to hold them the correct distance apart and upright. Be sure, too, that the posts are not in winding. The ground must be trenched to hold the bottom cross-pieces, and these must be in the same plane if the posts are to be in alignment. A good plan is to make the trenches extra deep and lay the cross-pieces upon brick footings.

When all is satisfactory fix the ridge and the two lower eaves members, nailing them into their notches. To them the rafters are fitted, being cut at an angle at the top to fit against the ridge, and notched over the eaves members. To give an upward turn to the roof at the lower ends, tapered pieces are nailed to the rafters as shown in Fig. 379. After nailing them, the ends can be cut at the required angle. Nail the rebated weather boarding on, adding extra pieces at the ridge.

The gate in Figs. 377 and 378 is a straightforward framework tenoned together with a diagonal strut fitting behind the close boarding. The construction of gates is dealt with on page 409, and this can be followed when making that shown. The joints (if made in softwood) should be assembled with paint. When applying paint or other preservative pay special attention to end grain, which is always the weak spot.

POULTRY HOUSE

This house, being fitted with a hinged top flap and two sliding shutters, keeps warm during the winter months. Egg-boxes are provided at the ends, these having hinged lids so that eggs can be removed without going inside. If desired, a small opening with sliding shutter could be arranged to allow the birds to go in and out. Matching fixed over light frames forms the main structure, and the whole is so arranged that it can be taken to pieces if it is desired to move it. The roof is covered with felt, though

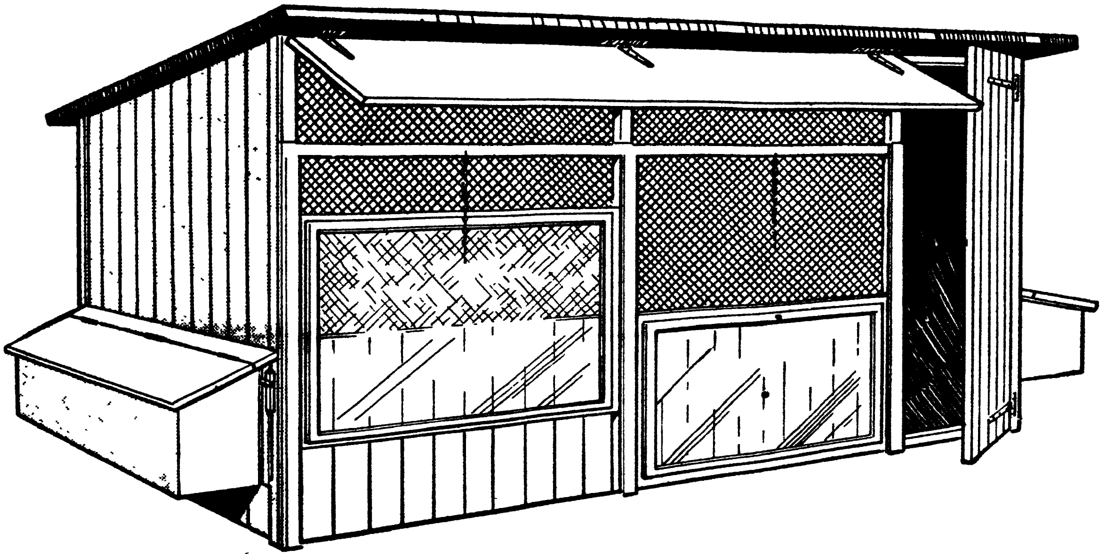


FIG. 380.—POULTRY HOUSE WITH EGG BOXES, SLIDING SHUTTERS AND FLAP.

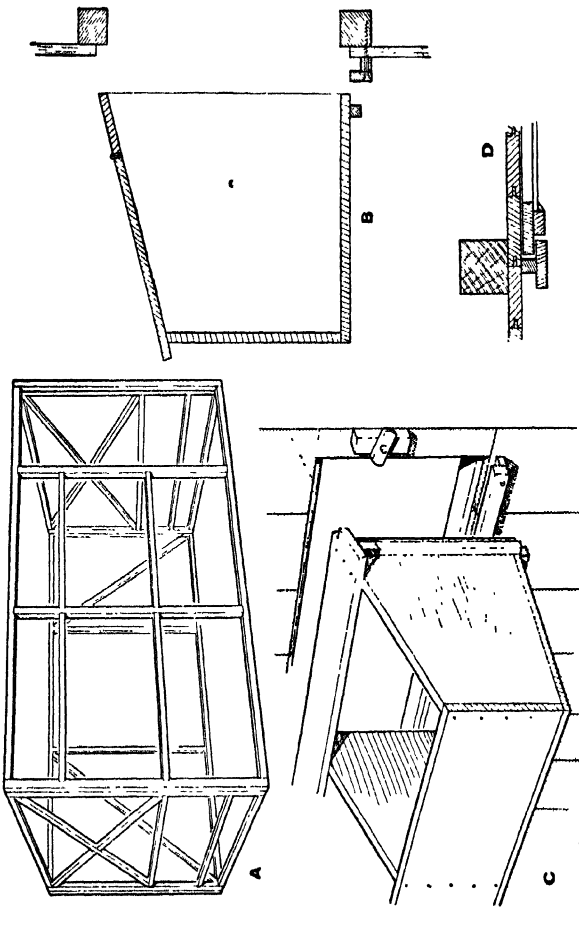


FIG. 381.

A. How the main frames fit together.
B. Section through egg boxes.
C. How egg boxes are made.
D. Section through shutters.

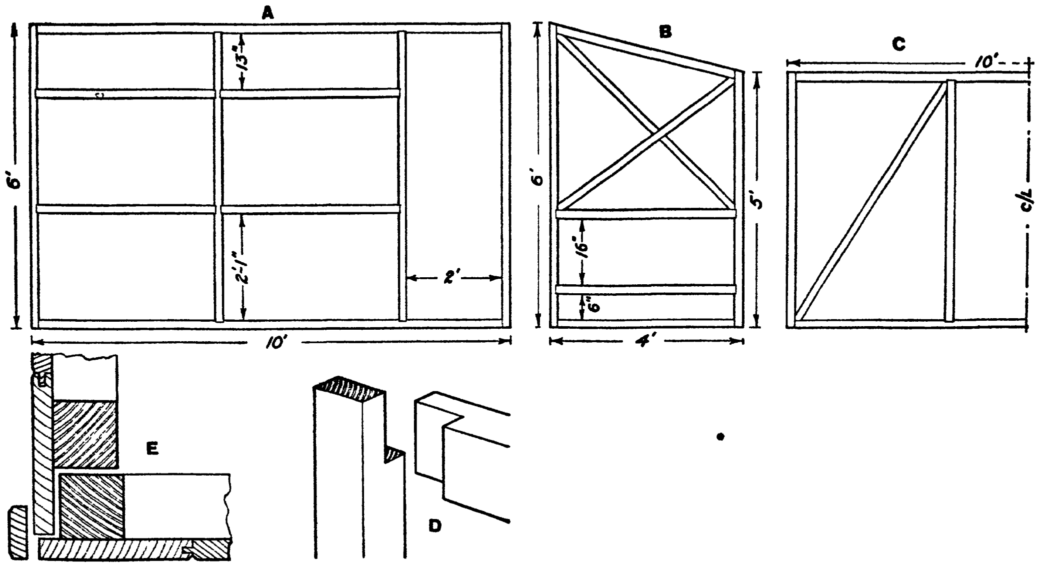


Fig. 382.

A. Sizes of front frame.
B. End frame.
C. Back frame (half shown).
D. Halved joint of framework.
E. Plan section through corner.

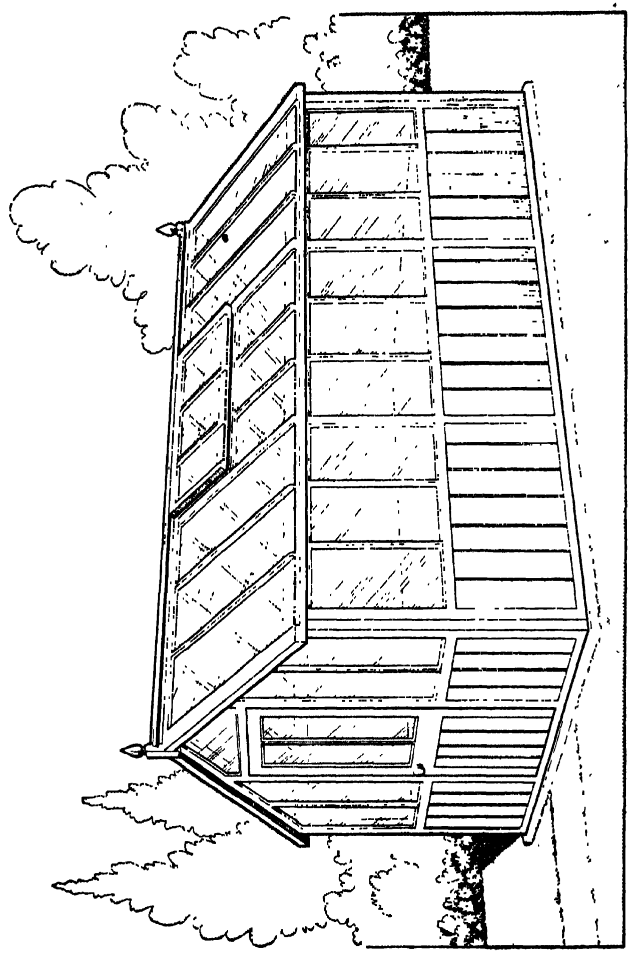


FIG. 383.—GREENHOUSE MEASURING APPROXIMATELY 10 FT. BY 6 FT. 7 INS.

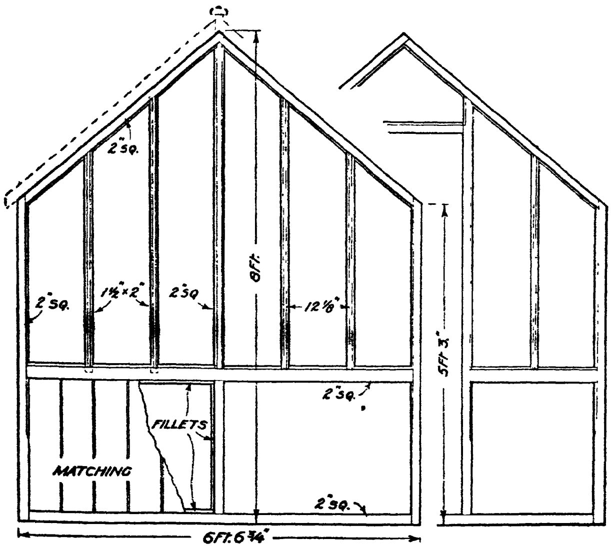


FIG. 384.—ELEVATIONS OF THE TWO ENDS.

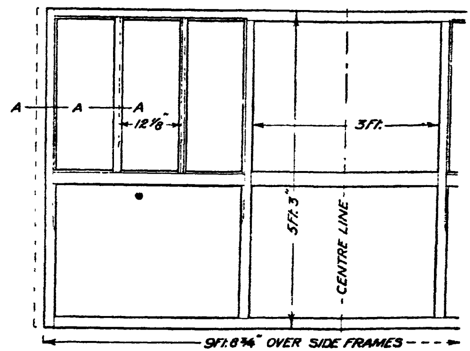


FIG. 385.—ELEVATION OF SIDE FRAME.

alternative is to form rebates by fixing together two or more parts to form the glass rebates, but, since a greenhouse has to withstand temperatures of all kinds and is subjected to severe climatic conditions, this is not in the long run satisfactory. One point to be noted is that in normal times the various parts can largely be obtained ready prepared in unlimited lengths. This, of course, is the simplest way of setting about the job, but the particular sections obtained may vary from those given in these drawings, and allowance must be made accordingly. For instance, in some of the members the rebates run out. This would not occur if ready-prepared sections were used, and consequently the joints would have to be revised to allow for this. It would probably necessitate one shoulder being made longer than the other. However, by following the general construction given and adapting according to the material available, a satisfactory job can be made.

One point to be noted is that in the best type of greenhouse there are special refinements which allow for the draining away of moisture which is the result of condensation. For instance, sloping notches are frequently cut in the lower rails of the roof, with a small hole emerging at the front; thus the water can escape easily, as it forms on the underside of the glass and runs down. This not only saves water dripping inside, but helps to prevent deterioration of the timber. Such notches could always be cut in the present house design.

Main sizes are given in Figs. 384 and 385, and it should be noted that these are founded upon the standard width of 12 in. for the glass. In this way considerable wastage in glass can be often avoided. Apart from this, however, the main size can be varied widely to suit special requirements. For instance, the length could be increased by one or two windows.

SIDE FRAMES

These are shown in part elevation in Fig. 385, and it will be seen that they are contained between the end frames. The bottom rail is plain and square, but the uprights are

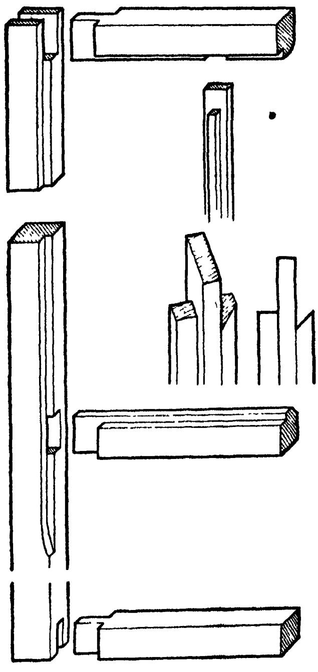


FIG. 386.—JOINTS OF SIDE FRAMES.

rebated in their upper part to form a rebate for the glass. The top rail is also rebated on its underside, and the middle rail on its upper side for the same purpose. If, however, it is proposed to fit a window in the side, the rebate will be stopped level with the intermediate uprights, see Fig. 385.

It will be clear from this that the top and middle rails will have long and short shoulders as shown in Fig. 386, because the front shoulder must reach right into the rebate. In the bottom rail, however, the shoulders are level. The top and bottom joints are really in the form of bridle joints, which are simpler to cut than the mortise and tenon.

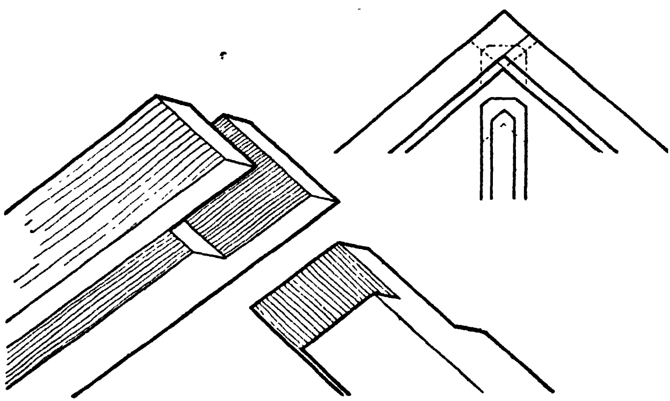


FIG. 387.—TOP JOINT OF ENDS.

The same illustration, Fig. 386, also shows how the bars are jointed. Since the inside edges are chamfered, the inner shoulders must be cut at an angle so that they fit over the chamfer, whilst at the outside the shoulder reaches down into the rebate.

Fix all corresponding pieces together temporarily when marking out, so that all are marked alike. The marks, of course, are squared right across. When the joints have been fitted, the whole thing can be put together with paint rather than glue. It is advisable to peg the corner joints.

END FRAMES

These are shown in Fig. 384, and it will be seen that an opening for a door is made at one end; apart from this there is little difference between the two frames. The same general construction as that given for the side frames is followed, but at the top, of course, the sloping top rails necessitate the joints being cut at an angle. To get the angle exact an adjustable bevel should be used. The

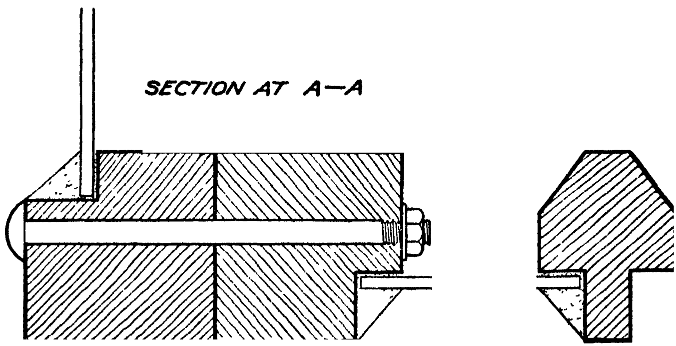


FIG. 388.—PLAN SECTION THROUGH CORNER.

simplest plan is to make a drawing to scale and set the bevel to the angle that is formed. As given, the apex does not form a right angle, and consequently the lower angles cannot be marked with the 45 degrees mitre square, but you could, of course, increase the height, and so make the top angle a right angle if preferred.

Details of the top joint are given in Fig. 387. Note that, since the rebate is taken right through, the shouldered member must have the front shoulder longer than the rear one. Fix together the bottom rail, mid rail, sloping top rails, and the posts first. Assemble them flat on the ground, making sure that they are square. This will enable you to obtain the exact length of the centre up-

right. The rail lengths can also be obtained by laying the material in position and marking at the ends. Note that here again long and short shoulders are needed.

Details of the fixing of the centre upright are given in Fig. 387. It will probably be found simpler to make the joint whilst the frame is temporarily together and then separate the parts before cutting. Assemble the whole thing similarly to the side frames. Note from Fig. 384 how fillets are fixed round the lower openings to form a rebate into which the matching can drop. The latter is nailed in. Incidentally, however, it is always advisable to give a coat of paint to all rebates before the matching is fixed.

At this stage the frames can be erected in position, and it may be noted here that it is always advisable to raise the whole thing from the ground whenever possible. A brick footing is quite good, or a low footing of cement can be prepared. In both cases, however, allow gaps at intervals so that air can circulate beneath the flooring. The section in Fig. 388 shows how the corners are joined with bolts.

ROOFS

Details of these are given in Fig. 389. There is the rebate for the glass at sides and top, but note that the bottom rail is thinner and is flush with the rebate. The reason for this is that it allows the glass to lie flat on top so that water drains away without hindrance. The joints are shown in Fig. 389; at the top is the normal tenon with long and short shoulders, whilst the bottom tenon must be bare-faced. Since the top edge must necessarily be at an angle (it has to fit against the ridge board), the tenon must be set in a fair way so that it is not exposed when the wood is planed. Note from Fig. 389 how the

intermediate rails are fitted with a cross piece between to give a seating for the ventilator.

This main framework can be put together, and the rails added afterwards. The last named are tenoned at the top, and fit into notches at the bottom. The section in Fig. 390 shows how the ventilator is made. A raised edging

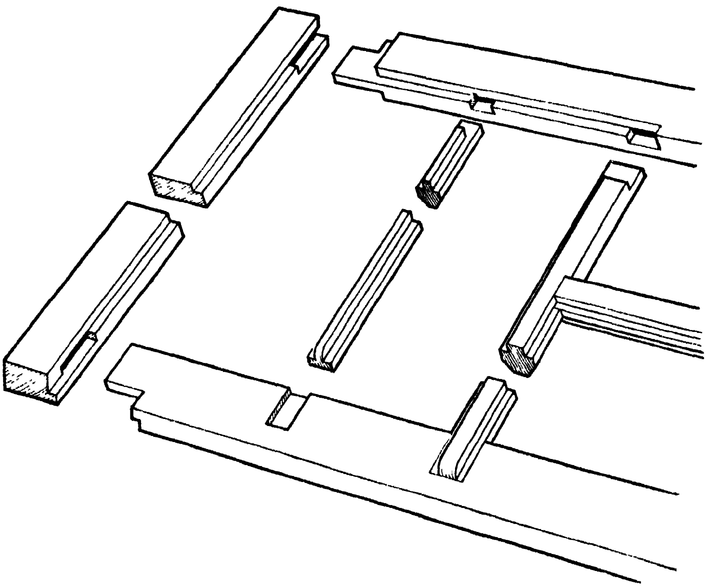


FIG. 389.—CONSTRUCTION OF ROOF.

is fitted around the opening to form a framework, and the ventilator frame itself is hinged to it. Note how the drip grooves are worked at the under-side to prevent water from creeping inwards.

Fix the ridge board by cutting away the apex of the end frames and notching the ridge board slightly. Hold in position with nails and fit each roof frame in position,

driving screws in convenient positions to keep the whole tightly together, well greasing the screws so that they will not be liable to rust. The door can be of any simple glazed pattern.

FLOORING

This can be made up and laid after the house has been erected. It consists of a series of joints cut to fit across the

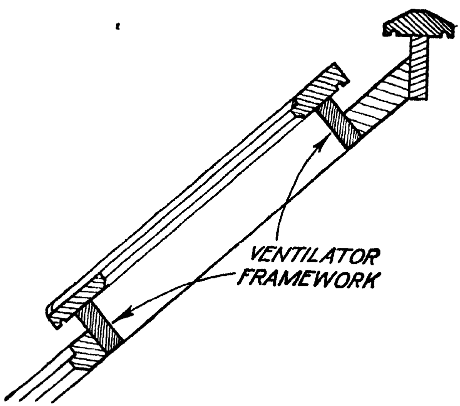


FIG. 390.—SECTION THROUGH VENTILATOR.

width of the house and either fitting bodily over the bottom rails of the side frames or being notched. The flooring proper is nailed to these joists. It thus forms a complete unit, and in the event of re-erection the sides are built around it. Interior staging can be of any simple shelved or stepped pattern.

Before any glazing is attempted the rebates must be painted, otherwise the putty will not adhere to the bare woodwork, owing to the moisture being rapidly absorbed. Lay a good body of putty in the rebates, press in the

panes, and putty the corner as shown in Fig. 388. Where it is necessary to use two panes to an opening, fit the lower one first and then the upper one, so that it overlaps. A sprig should be driven in at each side beneath the upper pane to prevent it from dropping. This applies especially to the roofing glass where two or more panes will be required.

Well paint the greenhouse, and if possible give a fresh coat each year.

PORTABLE GARAGE

16 ft. by 10 ft.

The advantage of the portable garage is that it can be taken to pieces and transported easily to another site if required. That shown in Fig. 391 is of this type. It is made up of four separate frames forming the sides, and the roofs. The sides are held together with bolts, and battens are nailed on the corners. When the garage is to be dismantled, the battens are stripped off and the bolts undone. The roofs are fixed with screws. The sizes given can be varied to suit any special size of car, but they will be found suitable for most cars up to 16 h.p. In any case it is advisable to check up the dimensions of the car, bearing in mind that it is the door-opening sizes which count. A little extra length is desirable to allow easy clearance. One point to remember is that various local authorities have certain requirements which have to be observed, and these should be ascertained before a start is made. Asbestos board is suggested for the walls of the garage, making it more or less fire-resisting, but the design should be submitted before beginning the construction.

PREPARING THE SITE

To make a good foundation, a footing of concrete should be laid in a trench dug beneath the walls. By driving in pegs and using a spirit level, the trenches can be made level. They should be about 9 in. wide by about 1 ft. deep. At the bottom some brick rubble or clinker is well rammed down, and the concrete laid on this. It is advisable for the whole floor of the garage to be of concrete also, and the earth to take it can also be dug, though the concrete is not laid until later. *D*, Fig. 393, shows a section with these details. One point is that the site should, if possible, allow for drainage away from the garage.

MAKING THE SIDE FRAMES

The sizes of these are given in Fig. 392. They are made up of 2-in. by 2-in. stuff fixed together with simple notched joints nailed to each other. Diagonal struts are added to give stability. If all the notches are cut in ½ in. deep, it is a simple matter to ascertain the exact length of the various members. Where there are several pieces all of the same length, one should be cut out first, and all the remainder cut to it. A mitre box with a square cut in it is useful, as it enables all the cuts to be made dead square without the necessity of squaring round guiding lines. Those sets of parts which have notches cut in the same position should be cramped together and marks squared across the whole. In this way the notches are bound to be alike. A gauge can be used to mark in the depth of the notches.

The best way of assembling the frames is flat on the ground. Taking first the long side frames, nail up the top and bottom rails to the end posts. Follow with the uprights at each side of the window openings, and then

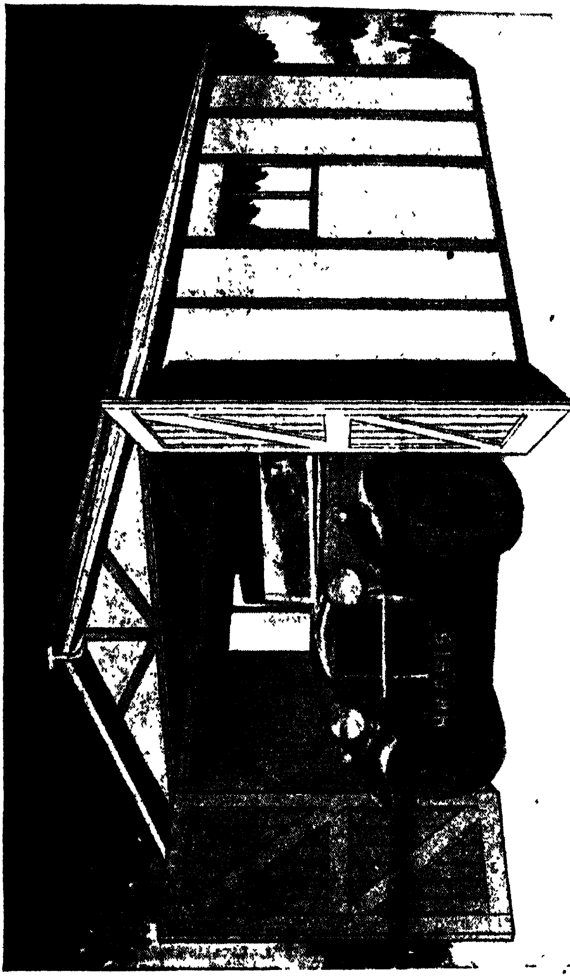


FIG. 391.—PORTABLE GARAGE SUITABLE FOR CAR UP TO ABOUT 16 H.P.
It is made up of the two sides, end frames, and roof. The parts are bolted together so that they can be taken apart easily when required.

fix the horizontal pieces. The short intermediate uprights follow. It is advisable to fit the diagonals individually. They are skew-nailed in position.

Details of the end frames are given at *B* and *C*, Fig. 392. Fix up the lower rectangular portion first, and add the top triangular part afterwards.

When all four frames have been completed they can be erected and bolted together on the concrete footing. Assistance is necessary while this is being done. Note that the long side frames fit outside the ends (see dotted lines at *B* and *C*, Fig. 391). Two frames being erected, a couple of handscrews can be fixed on temporarily to hold them. The bolt holes can then be bored right through both uprights. Add the bolts as at *B*, Fig. 393, with the heads outwards. These heads should be square and should be recessed in flush. Washers are slipped on inside, so that the nuts do not bite into the wood.

The concrete flooring is now laid. It stands down about 1 in. below the top of the bottom rails, to allow a cement top dressing to be added (*D*, Fig. 393). A ramp can be formed outside the door to allow the car to pass in easily. The earth is dug away and filled with concrete, and a dressing of cement added to bring it level with the top of the bottom rail.

FIXING THE ASBESTOS BOARD

This is in the form of panels, the joints being arranged to be opposite the uprights, so that they can be nailed. Galvanised nails are used. At the corners the board should stop level with the bolted joints, so as not to interfere with taking the whole thing apart. A narrow

FIG. 392.—ELEVATIONS WITH MAIN SIZES AND ROOF DETAILS.

A. Dimensions of long sides.
B. The end frame.
C. End frame with door.
D. Section through ridge.
E. Section of roof at side.

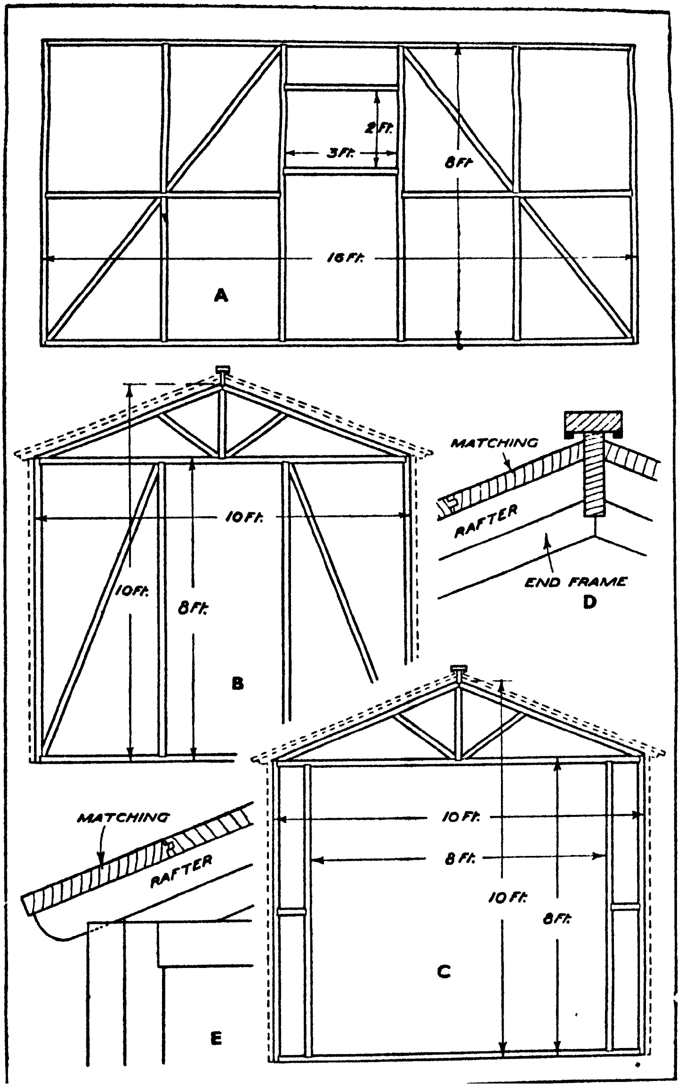

2 Ft.
3 Ft.
8 Ft.
16 Ft.
A
10 Ft.
10 Ft.
8 Ft.
B
MATCHING
RAFTER
END FRAME
D
MATCHING
RAFTER
E
10 Ft.
8 Ft.
10 Ft.
8 Ft.
C

FIG. 392.

strip can be nailed on the ends of the frames to make the whole level. Any gaps in the joints can be filled in with a waterproof compound. All joints are then covered with battens (*B*, Fig. 393). The battens are painted first, and a coat of the compound is laid on the back to prevent water from creeping in.

THE ROOF

The first step is to fix the ridge board, a piece of stuff some 6 in. by 1½ in. in section. Notches to hold it are cut at the point of the two end frames. A series of rafters is now cut to fit against the ridge board at the top (*D*, Fig. 392) and over the side rails (*E*). Note that a rafter lies directly on top of the sloping rails at both ends of the garage. If the notch for one of these is cut first, it will serve as a guide for those between which have no midway support. To the top of the rafters matchboarding is nailed. The boards at the top must be chamfered, so that they fit up against the ridge board.

The whole thing is covered with sheets of asbestos board, this being nailed down as before and the joints filled with a sealing compound. Battens are laid over the joints. The whole roof is secured with screws driven upwards. Put plenty of grease on the screws to prevent them from rusting. Note that a capping piece is fitted above the ridge board. The small strips at the edges of the underside prevent water from running in.

DOORS AND WINDOWS

C, Fig. 393, shows how the doors are made. A sufficient number of pieces of matching are fitted together and

FIG. 393.—HOW MAIN FRAMEWORK IS PUT TOGETHER.

A. View of framework from above.
B. How sections are bolted together.
C. Method of making doors. *D*. Sections through base.
E How window frames are made.

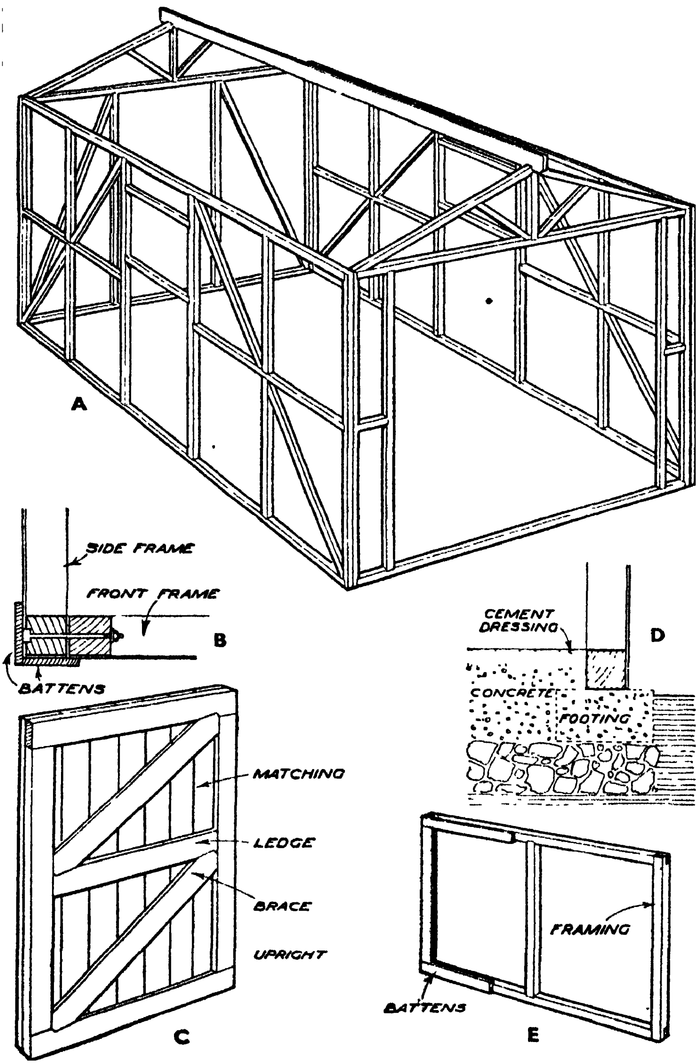

A
SIDE FRAME
FRONT FRAME
B
BATTENS
CEMENT DRESSING
D
CONCRETE
FOOTING
MATCHING
LEDGE
BRACE
UPRIGHT
C
FRAMING
BATTENS
E

FIG. 393.

nailed to a framework. For a simple job the latter can be butted together and held with wriggled nails. The braces are necessary to prevent sagging. The front can be covered with asbestos board. Large strap hinges are used to hang the doors, and the right-hand one should have a closing bead nailed on.

The window-frame construction is shown at *E*, Fig. 393. Square stuff 1½ in. in section is halved together, and battens are fixed to the front to form a rebate for the glass. They are hinged at the top to give ventilation. To prevent water from creeping in at the sides, fillets are nailed to the main framework just at the back of the window frames.

TRAILER CARAVAN

The housing shortage has added to the popularity of the trailer caravan, and some people are living in them more or less permanently. It is quite within the powers of the home craftsman to build one, providing that he can get a proper chassis and the necessary material for the body. The former should certainly be built specially for the purpose, as otherwise trouble in swaying may be experienced. For the body a hardwood such as ash is preferable for the main framing of the sides and floor, though for the latter a clean softwood can be used if it is of correspondingly heavier substance. The covering can be of a hardwood such as *masonite*, or it can be of aluminium. Probably, too, other materials will become available. The chief thing is that it is water-resistant and free to bend around the curves.

The design in Fig. 394 is intended as a three-berth caravan and it should be within the power of a 12-h.p. car over reasonable country. The interior lay-out is not given, as readers will probably prefer to work this out in

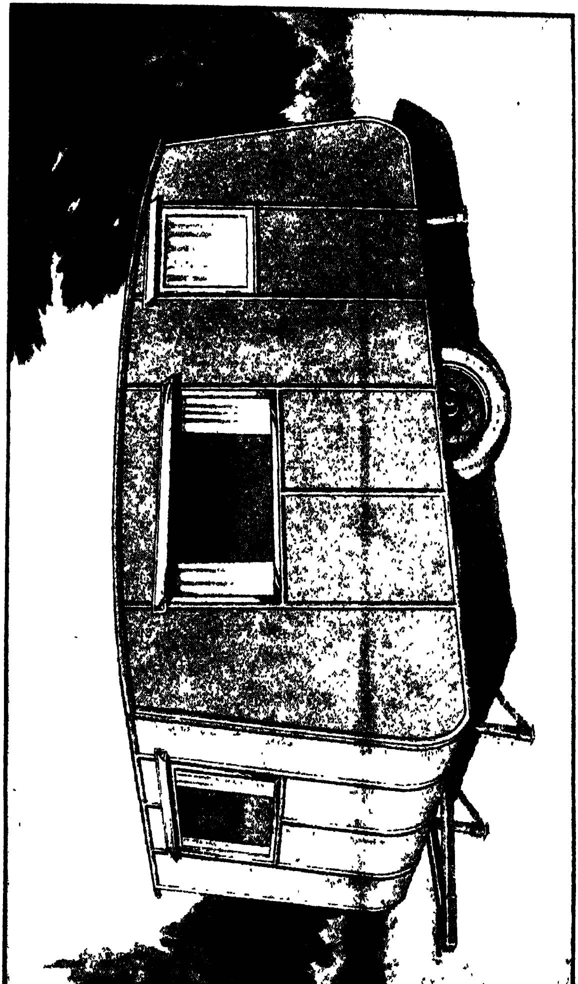


FIG. 394.—TRAILER CARAVAN TO ACCOMMODATE THREE PEOPLE.

accordance with their own ideas. Either three single bed-settees can be arranged, one at each side and one at the end, or a double bed can be arranged at one side to fold

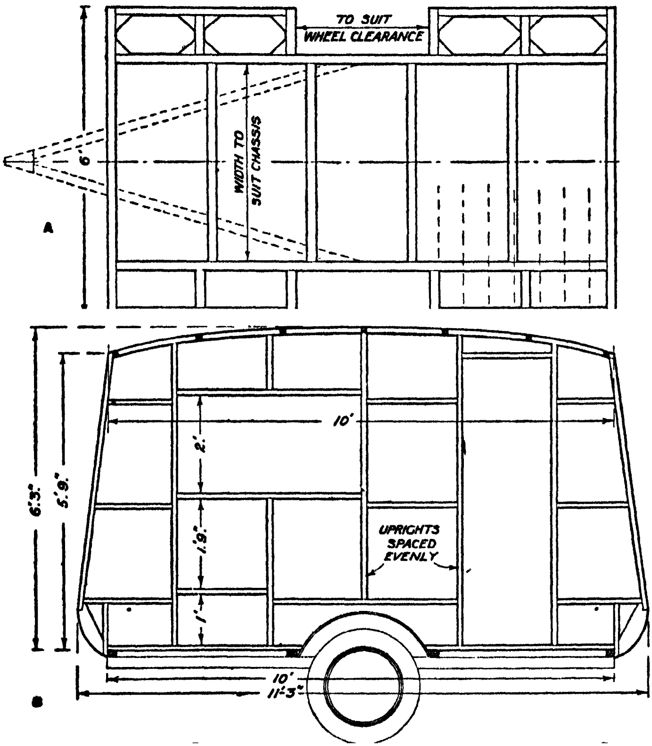


FIG. 395.

A. Plan of main floor frame.
B. Side elevation showing side framework.

into single size during the daytime, with a single bed at the end.

It will be appreciated that the sizes of the whole thing

will have to be adapted in accordance with the particular chassis to be used. The dimensions in Figs. 395 and 396 will therefore have to be amended to suit, and should be taken as a general guide only. The chassis should be obtained first, and the body built to suit it. In any case, of course, it is essential, because the body is built on to it.

Make the main floor framework first, arranging the various members so that they receive direct support from the girders of the chassis. Figs. 395 and 397 show in a general way a suitable construction. The stuff might be 2 in. square, and should be put together with mortise and tenon joints, preferably taken right through and wedged. Note that a

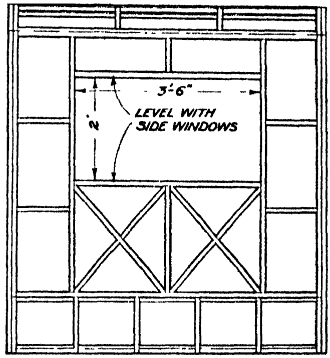


FIG. 396.—ELEVATION OF END FRAMEWORK.

space must be allowed to give ample clearance for the wheels. It can be strengthened considerably by screwing in angle brackets as shown, especially the portions which overhang at each side of the wheel-gaps. If possible use a water-resistant glue such as synthetic resin; otherwise use thick paint. Bolt the frame to the chassis.

The body is built in five separate sections: two sides, two ends, and roof. Deal first with the sides. The top curved members should preferably be steamed and bent. Otherwise they can be in three thicknesses, bent around pegs or a former, and glued together. When the glue sets they will retain their shape. All the main straight members can be marked out easily, but at the top it is an advantage to allow them full in length. The frame can then be assembled, the curved member laid in position,

and the shoulders marked across. Make sure that both sides are balanced. The bottom horizontal can be taken right through in a single length and be cut away at the wheel gap afterwards. If ash is used it could be 1 in.

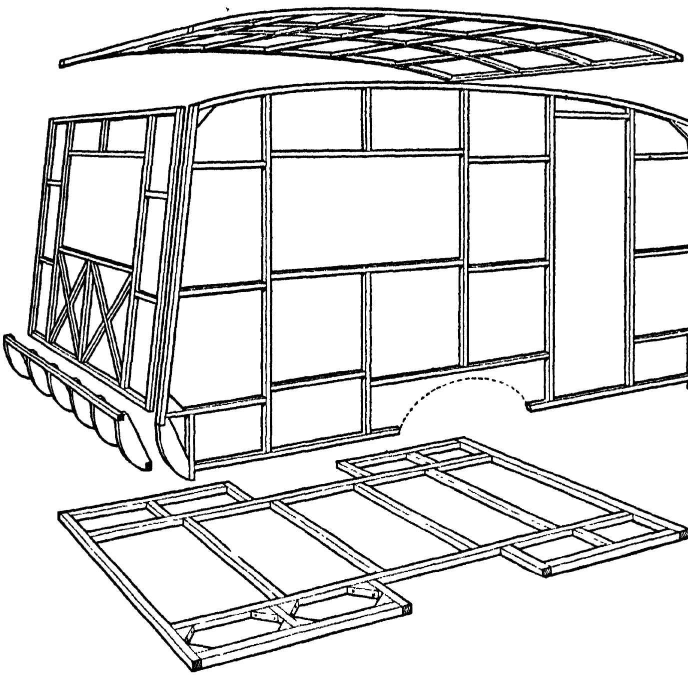


FIG. 397.—HOW SIDE AND END FRAMES AND FLOOR FRAMES ARE MADE.

square. Note that at the bottom curved ends shaped pieces are cut in and screwed.

End frames are made similarly as suggested in Figs. 396 and 397. It is advisable to make the top members rather wider, so that they can be planed to accord with the roof

slope. At the bottom a separate frame consisting of curved pieces joined with rails is made. This can be built in after all four frames have been assembled. Erect the frames in position, screwing or bolting them to the floor framework.

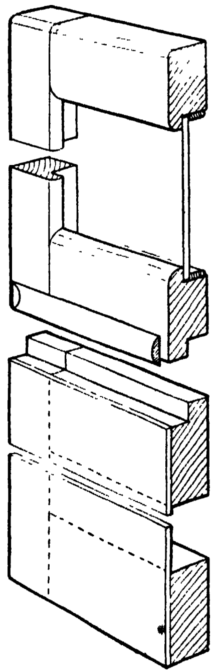


Fig. 398.—Construction of Double Door.

The roof consists of four curved members of the same curvature as the top side rails, joined by cross members. The last named can be tenoned in. If anything, they should be rather deeper at the middle in the centre of the caravan, so that there is a slight cross-camber. At all events, avoid a drop in the middle. Screw the whole thing in position.

The covering should be arranged so that joints occur in the middle of rails so that there is good bearing surface. Paint all joining surfaces before nailing. Various covering strips to fix over the joints can normally be obtained, those in aluminium being the most suitable. This material will bend easily to run around the curve. It should be screwed on. Before fixing these, however, the roof should be waterproofed by the application of canvas or linen. Paint over the whole roof with red lead or spray with cellulose, and, whilst still wet, stretch the material over, turning down over the sides. If possible fit a metal channelling around the sides to carry away water. Afterwards paint or spray afresh. Note that all covering

mouldings should be painted inside before applying, and be screwed on whilst the paint is still wet.

Window-frames can either be of light metal purchased for the job, or be of wood put together with through tenons. Either a rebate can be arranged in the frame-work, or slips of hardboard can be applied to form rebates. The glass is puttied in from inside, a good bed of putty being allowed. To prevent water from creeping in a head or overhanging cape is arranged as in Fig. 394. This can be either of wood or be made of sheet metal screwed on. Fig. 398 shows the double-door construction. This is arranged so that the top part with the glass window can open independently of the lower portion. Note the rebate between the two. Remember to paint all joining surfaces before putting together to prevent damp from creeping in; and paint all outer surfaces well.

It will be realised that the wheels necessarily project up into the body of the caravan, and this necessitates boxing the body accordingly. Allowance must be made for this, of course, when planning the interior.

The interior of the box can be filled in with painted sheet metal so that mud does not reach the box. It is, of course, essential to keep out damp. One last point. As a rule the wheels can be slipped off when the sides are taken straight through, providing that there is ample clearance. This is a point to be checked at the outset. If there is insufficient clearance, the side will have to be cut away in a curve (see dotted line in Fig. 397).

Note from Fig. 395 that the floor boarding runs from side to side. This is not essential in every case, but is an advantage in the design given because it helps to support the overhanging portions at each side of the wheel gaps. Tongued and grooved boarding should be used.

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